The species of *Chisocheton* (Meliaceae)*

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Synopsis

The Indo-Malayan genus *Chisocheton* Blume (Meliaceae) is revised. There are 51 species, of which seven are newly described (*C. aenigmaticus*, *C. crustularii*, *C. granatum*, *C. lansiifolius*, *C. pellegrinianus*, *C. rex*, *C. vindictae*) and four (three undescribed) are still poorly known, arranged in four sections, one (*Rhetinosperma*) new. Two series (*Sandoricocarpi* and *Schumanniani*) and two new subspecies (*C. macrophyllus* subsp. *fulvescens* and *C. pentandrus* subsp. *medius*) are formally described. Four new combinations (*C. perakensis*, *C. tomentosus*, *C. cumingianus* subsp. *kinabaluensis*, and *C. pentandrus* subsp. *paucijugus*) and one *nomen novum* (*C. koordersii*) are proposed. The genus *Megaphyllaea* is reduced to a synonym of *Chisocheton* for there is a range of floral construction from two whorls, the allegedly distinguishing feature of *Megaphyllaea*, to one in ser. *Pauciflori* of *Chisocheton*. There are prefatory accounts of the history of the discovery and taxonomy of the species, and notes on growth form (transition from Corner's to Champagnat's Model), axis and wood, leaf (the nature of the shoot-like 'leaves', usually pseudogemmulate and sometimes bearing 'epiphyllous' inflorescences, is discussed at length), flower, fruit and seeds (arillate and sarcotestal present). Variation patterns, both ecogeographical and checkerboard, within species and their taxonomic treatment, particularly that of the latter in New Guinea, are discussed. The ten species names excluded from the genus are referred to *Aglaia* Lour., *Dysoxylum* Blume and *Walsura* Roxb.

Introduction

The moist forests of the Indo-Malayan region characteristically have small to medium-sized Meliaceous trees in their understorey, notably species in the genera *Aglaia*, *Aphanamixis*, *Dysoxylum*

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and *Chisocheton*. There exists no modern monograph of any of these genera, except the generic accounts in Harms's Meliaceae in Engler & Prantl's *Die Natürlichen Pflanzenfamilien* (1896, 1940), other than that of Casimir de Candolle of 1878, and the lack of information makes the naming of these species and an understanding of the interrelationship of insular floras of the region difficult. Synonymy abounds, particularly as some species are very widespread, as in *Aphanamixis* (Corner, 1946).

Aphanamixis is a small genus, whilst *Dysoxylum* and *Aglaia* are comparatively large and widespread in the Pacific area; *Chisocheton* comprises 51 species distributed from eastern India to southern China, throughout the islands of the China Sea to northern Australia, and eastwards to the New Hebrides. In New Guinea *Chisocheton* species are a common feature of the understorey of lowland rain forest, rarely growing (elsewhere) at high altitudes, although *C. ceramicus*, *C. pentandrus* and *C. cumingianus* subsp. *kinabaluensis* occur in the forests of the upper slopes of Mount Kinabalu in Borneo.

In general these small trees are of little commercial value, although in India *Chisocheton cumingianus* has been tested for the quality of its wood which is softer than *chir* (*Pinus roxburghii* Sarg.) (Pande *et al.*, 1957); in New Guinea this species is used as a fish poison; the oil expressed from its seeds has been used in soap-making and as a purgative in the Philippines (Burkill, 1935, 1 : 526–528). The oil of *C. pentandrus* has been used as hair oil and that of *C. macrophyllus* as an illuminant. Some forms of *C. lasiocarpus* from New Guinea* are highly ornamental and are successfully cultivated at Lae and Bogor Botanic Gardens; *C. polyandrus*, a striking pachycaul treelet from Borneo with long peduncles of creamy red flowers, would also be well worth establishing in cultivation (*cf.* Menninger, 1964 : 161, t. 228).

The distribution of the genus is that of the Indo-Malayan rain forest, and the discovery of its 51 species is therefore of some interest, being a reflexion of botanical endeavour in Malesia. Much of the detailed information below has been culled from van Steenis-Kruseman (1950, 1958, 1974).

Species of *Chisocheton* first appear in the literature in 1814, with William Carey's publication of William Roxburgh's *Hortus bengalensis*, in which *C. tomentosus* and *C. cumingianus* (subsp. *balansae*) appear as *Melia tomentosa* and *Guarea paniculata* respectively. *C. tomentosus* was collected in Penang, perhaps by Roxburgh's son in 1802 or by Christopher Smith in 1805–6; *C. cumingianus* was grown from material sent by Matthew Smith of the Silhet Botanic Garden although the earliest herbarium specimen is that collected by Francis Buchanan (later Hamilton) in Assam in 1808. Both species flowered at Calcutta and drawings of them were made there. Calcutta's collectors included George Porter, who accompanied Roxburgh's eventual successor, Nathaniel Wallich, to Singapore when the first Botanic Garden was set up there, and remained in Penang as a schoolmaster, collecting *C. penduliflorus* there in the same year. Another of Wallich's collectors, Gomez, found *C. grandiflorus* in Tavoy in 1827.

Meanwhile, Caspar Reinwardt, founder of Buitenzorg (now Bogor) Botanic Garden, had discovered three of the four native Javanese species before 1822: *Chisocheton pentandrus*, which he thought was Francisco Noroña's *Irina* (Sapindaceae) and labelled it thus, and *C. macrophyllus*, both sterile, as well as *C. patens*, which he called *Melia pendula* (it may have been discovered by Roxburgh's son in (?) 1803, for there is a specimen at CALC labelled 'Malacca R'). The assistant curator at Buitenzorg, Alexander Zipelius, found *C. lasiocarpus* in Irian Jaya on the voyage of the *Triton* and *Isis* in 1828.

Of the remaining 43 species recognized as distinct in this revision, the next to be discovered were chiefly the finds of Dutch botanists. The freshwater peat swamp forest tree, *Chisocheton amabilis*, was found by Pieter Korthals on the River Balito in southern Borneo in 1836, *C. diversifolius* by Johannes Teijsmann in Sumatra in the 1850s, and *C. ceramicus* by him with de Vriese in the Moluccas in 1860, whilst *C. lasiogynus* was probably discovered in Sumatra by Franz Junghuhn. In the British possessions, Sir Dietrich Brandis found *C. dysoxylifolius* in Burma in 1859, Alexander Maingay first collected *C. erythrocarpus* in Malacca in 1865–6 and Odoardo Beccari discovered *C. sarawakanus* in Sarawak in 1865–8. With the exploration of Perak

*According to J. M. Powell & K. Paijmans, *New Guinea Vegetation* : 109 (1976), the 'nut' of '*Chisocheton* sp.' is eaten in the Jimi Valley of Papua New Guinea and, in New Britain (p. 162), the timber is used for housebuilding.

and the discovery of *C. pauciflorus* in 1882 and *C. perakensis* the following year by King's collector, Hermann Kunstler, all the known species from the peninsula and from Java had been found. A few years later, W. A. Sayer found *C. sayeri* on Cuthbertson's expedition to Papua in 1887 and O. Warburg collected *C. warburgii* (subsequently never refound) in Sulawesi on his world voyage of the following year.

The next decade saw George Haviland, medical officer to the Sarawak Government, sending out collectors, one of whom, Kunoeang, found the curious pachycaul treelet, *Chisocheton setosus*, in Limbang in 1890, whilst the year before, Haviland himself had discovered at Padawan *C. ruber*, a cauliflorous tree restricted to the Sarawak limestone. Hans Hallier, based at Buitenzorg, found the pachycaul *C. macranthus* on G. Kenepai in Borneo in 1893–4, and in Sulawesi, Sijfert Koorders, also of Buitenzorg, found *C. celebicus* and *C. koordersii* in 1895, whilst in Australia, the only species known from that continent, *C. longistipitatus*, was first collected by Ebenezer Cowley in the inhospitable Queensland forests before 1899.

More than half, then, of the known species had been discovered by 1900, but even now new species are being found in New Guinea and Borneo. In 1902, *Chisocheton sarasinorum* was found by the Swiss zoological cousins Sarasin in Sulawesi, and Raden Mas Pringgo Atmodjo found *C. vindictae* in northern Sumatra on van Daalen's expedition of 1904, whilst Forest Officer Hugh Curran found *C. curranii* on Luzon in 1906. The Dutch Lorentz expedition to Irian Jaya added *C. pilosus*, collected by Gerard Versteeg in 1907 and subsequently never refound. Five years later, the highlands of Papua New Guinea were visited by Carl Ledermann on the Kaiserin Augusta-Fluss (Sepik) Expedition, and a species with epiphyllous inflorescences, *C. pohlianus*, collected. *C. laosensis* of the Moluccas was probably collected before 1914, in which year the Philippine endemic, *C. cauliflorus*, was found by Maximos Ramos of the Bureau of Science, Manila, and he also added *C. mendozai* two years later, so that all the known Philippine species had been discovered. 1918 saw *C. polyandrus* discovered by Devillo Wood, Conservator of Forests at Sandakan, Sabah and *C. aenigmaticus* by Karel Heyne's collector, Achmad, on Simalur Island off Sumatra.

In 1922–3, Adolph Elmer, an American collector based in the Philippines collected the pachycaul *Chisocheton medusae* in fruit near Tawao, Sabah, whilst François Evrard found the last-discovered Asiatic species, *C. pellegrinianus*, in Vietnam. Three years later, Frederick Endert of Buitenzorg found *C. lansiifolius* in W. Kutai in Borneo, where Joseph and Mary Clemens discovered *C. granatum* in 1931 during their long stay on Mount Kinabalu; Mrs Clemens also found a second species with epiphyllous inflorescences, *C. tenuis*, at Sattelberg in Papua New Guinea in 1935. After this period there is a gap of about twenty years engendered by the war, in which many *Chisocheton* types were destroyed at Manila and Berlin, the only new species collected being *C. stellatus* found by Ryôzo Kanehira and Samihiko Hatusima in Irian Jaya in 1940.

In 1953, Michael Jackson and Gregory McDonald of the Forest Service found *Chisocheton schoddei* on the Brown River in Papua, and, following intensive collecting by botanists based at Lae under John Womersley, were discovered *C. sapindinus* by Andrée Millar in 1959, *C. novobritannicus* by Andrew Gillis in 1965, *C. glirioides* by Ted Henty, as well as *C. montanus* by Richard Hornabrook and there is still at least one species too inadequately known to be formally described. Nothing new has been found in Asia, Philippines, Malaysia or Indonesia since the Second World War, except for *C. crustularii* first collected by L. S. V. Murthy of the Forest Department in Sarawak in 1965 as well as two insufficiently known species from the east of Borneo.

Lastly in 1970, the known distribution of the genus was extended by the discovery of *Chisocheton rex* in the New Hebrides by the Cambridge botanist, Timothy Whitmore.

The species recognized in this account are as follows:

(i) sect. *Clemensia*
1. *C. macranthus*, 2. *C. medusae*, 3. *C. tomentosus*, 4. *C. polyandrus*, 5. *C. penduliflorus*, 6. *C. crustularii*, 7. *C. setosus*.

(ii) sect. *Chisocheton*
(a) ser. *Schumanniani*: 8. *C. schoddei*, 9. *C. tenuis*, 10. *C. cauliflorus*, 11. *C. novobritannicus*, 12. *C. montanus*, 13. *C. pohlianus*, 14. *C. lasiocarpus*, 15. *C. pilosus*, 16. *C. sayeri*,

17. *C. aenigmaticus*, 18. *C. celebicus*, 19. *C. glirioides*, 20. *C. sapindinus.*
(b) ser. *Paniculati:* 21. *C. laosensis*, 22. *C. ruber*, 23. *C. sarawakanus*, 24. *C. lasiogynus*, 25. *C. amabilis*, 26. *C. macrophyllus*, 27, *C. dysoxylifolius*, 28. *C. cumingianus*, 29. *C. patens*, 30. *C. lansiifolius*, 31. *C. granatum.*

(iii) sect. *Dasycoleum*
(a) ser. *Pauciflori:* 32. *C. perakensis*, 33. *C. sarasinorum*, 34. *C. pauciflorus*, 35. *C. diversifolius*, 36. *C. grandiflorus*, 37. *C. mendozai.*
(b) ser. *Sandoricocarpi:* 38. *C. vindictae*, 39. *C. ceramicus*, 40. *C. curranii*, 41. *C. pentandrus*, 42. *C. pellegrinianus*, 43. *C. erythrocarpus.*

iv) sect. *Rhetinosperma*
44. *C. koordersii*, 45. *C. rex*, 46. *C. stellatus*, 47. *C. longistipitatus.*

Non satis cognitae: three other (?) new species and *C. warburgii* (see Enumeration).

Taxonomic history

Chisocheton cumingianus was first referred to the allied genus *Guarea* of tropical Africa and America by Roxburgh in *Hortus bengalensis; Chisocheton tomentosus* was included in *Melia*, a 'dustbin' genus for many Meliaceae as *M. baccifera* Roth (to *Cipadessa*), *M. excelsa* Jack (to *Azadirachta*), *M. iloilo* Blanco (to *Aglaia*), *M. koetjape* Burm. f. (to *Sandoricum*), *M. parasitica* Osb. (to *Dysoxylum*), *M. integerrima* Buch.-Ham. (to *Heynea* – see Mabberley (1977)), *M. pumila* Moon (to *Munronia*), etc. were included, and, in Wallich's '*Catalogue*', *Chisocheton penduliflorus* was *Melia penduliflora*, whereas *Chisocheton grandiflorus* was placed with *Chukrasia* in *Plagiotaxis.*

Meanwhile, Blume had erected the genus *Chisocheton* in 1825, distinguishing it from *Melia*, *Aglaia* and *Dysoxylum*, Reinwardt's *Melia pendula* becoming *Chisocheton patens.* Blanco, writing in isolation in the Philippines, placed *C. pentandrus* in *Trichilia*, of which genus he had a broad view not seriously held since, though hinted at by Kostermans as recently as 1966. Miquel took up Blume's lead, describing *Chisocheton diversifolius* in 1859, but later had qualms about the crudely formed generic name, his classical sensitivity forcing him to follow Sprengel's amended '*Schizochiton*' when describing *C. amabilis* and *C. ceramicus* in 1868. At this time he described *C. lasiocarpus* as a *Dysoxylum*, as he had only fruiting material to guide him.

Working on Cuming's collection in Russia, Turczaninow described a new genus based on *Chisocheton pentandrus*, separating it as *Dasycoleum* on account of its apparently indehiscent fruit; 20 years later Casimir de Candolle described more species in this genus, which Harms delimited as a section of *Chisocheton* in 1896. By chance, however, Turczaninow had stumbled on the distinction between those species with a sarcotestal seed (*Dasycoleum*) and those with an arillate seed, a distinction of supreme ecological importance and of evolutionary and taxonomic significance in the genus.

Casimir de Candolle's enumeration (1878) is the most recent account extant and although *Chisocheton* is divided artificially on trivial characters: free or 'fused' staminal tube, disk annular or stipitate, panicles branched or not, the account deals with all the species known up to that time including those described by Hiern for Hooker's *Flora of British India* (1875). Nine years later, Hemsley described *C. perakensis* in making his new genus *Megaphyllaea*, said to differ from *Chisocheton* in its multilocular ovary and in the biseriate corolla; *Megaphyllaea* is here incorporated in *Chisocheton* for the first time (see below). In 1889, K. Schumann established *Melioschinzia* for a 'new' species, which Harms correctly included in *Chisocheton* for it is a form of *C. lasiocarpus.*

Other species were described spasmodically by Koorders and others when Harms's account of the genus appeared in *Die Natürlichen Planzenfamilien*, dividing the genus into two sections as described above, the type section being further divided into series, of which one has been further divided in this account, a second passed to sect. *Dasycoleum* with *Megaphyllaea*, and the third to yet another section. His second account in 1940 keeps *Megaphyllaea* apart, as well as *Clemensia*, a genus established by Merrill on its polymery but reduced to a section in *Chisocheton* by Airy Shaw (1937), and *Rhetinosperma*, a genus made and tentatively assigned to the Sapindaceae by Radlkofer and based on the fruiting material of *Chisocheton longistipitatus* first described as a

Castanospora (Sapindaceae) by F. M. Bailey. In the new account Harms merely gives a provisional arrangement into series. At the end, a species Harms had described, *Chisocheton pohlianus*, was placed *incertae sedis* as it seemed curious in its epiphyllous inflorescences. Harms also prepared an account of the genus for the *Flora von Papuasien*, but this was a compilation rather than a revision, there being no keys and many new species rather uncritically described. This account has been replaced by an important review of the genus in Papuasia by Stevens (1975). Stevens also described all the new finds in the area, leaving a further seven to be added from Vietnam, Sumatra, Borneo, and New Hebrides in this account.

Although a few species of *Dysoxylum* etc. have been described in *Chisocheton* (see species *excludendae*), few *Chisocheton* spp. have been described in other genera since the early 19th-century fumblings, although Philippine collections of *C. ceramicus* and other species were unaccountably and repeatedly described in *Amoora* by Merrill and Elmer. In short, the circumscription of the genus has been rather stable despite the great variation in all characters to be found within the genus. I agree with the circumscription summarized by Pennington & Styles (1975), except in their maintenance of *Megaphyllaea* as a separate genus.

The inclusion of Megaphyllaea, a misleading pachycaul

In describing his new Meliaceous genus, *Megaphyllaea*, from material collected by Wray in Perak in 1885, Hemsley wrote, 'The biseriate petals are very remarkable, and it was first suspected that this was an abnormal condition; but we are assured by Mr Wray that they were so in all the flowers he had observed on more than one occasion' (Hook., *Ic. Pl.* t. 1708 (1887)). To the only known species *M. perakensis* Hemsley was added *M. annulata* (King) Ridley in 1922 (*Fl. Malay Penin.* **1** : 386) a species originally placed, somewhat hesitatingly, in *Chisocheton* by King in 1895 (*J. As. Soc. Bengal* **64** (2) : 32)*. The curious biseriate corolla of these two species is not recorded elsewhere in the family by Pennington & Styles (1975).

During the preparation of this monograph, itself a prelude to more profound study of evolutionary trends within the *Melioideae*, I found it necessary to study the species of *Megaphyllaea*, for sterile material of *Chisocheton ceramicus* is easily confused with that of *Megaphyllaea* as was first pointed out by King ('*C. spectabile* Miq.'). I have examined isosyntype material of *Chisocheton annulatus* at SING and compared this with the holotype of *Megaphyllaea perakensis* at K and unnamed material at KEP collected by Mr Kochummen at Maxwell's Hill. It transpires that *Chisocheton annulatus* was described from immature flowering material of *Megaphyllaea perakensis*, which accounts for the anthers of *Chisocheton annulatus* being 'attached at the very base of the tube' as the intercalary expansion of the staminal tube has not occurred. Flowerbuds in all stages are to be found in Kochummen's material.

Megaphyllaea perakensis resembles *Chisocheton ceramicus* not only in its leaflets but also in the pseudogemmula (Briquet, 1935), i.e. a persistent meristem producing new leaflet primordia in successive seasons, at the leaf apex, the thickened calyx, locellate anthers and other details of the flower. According to Pennington & Styles (1975), *Megaphyllaea* can be separated from species of *Chisocheton* only on its biseriate corolla. As no other Malesian Meliaceae, nor indeed all the species of *Chisocheton* have locellate anthers or pseudogemmulate leaves, it is clear that *Megaphyllaea perakensis* is particularly closely related to *Chisocheton ceramicus* and its allies. The double corolla of *Megaphyllaea perakensis* comprises an outer whorl of three large petals, tomentellous outside, and an inner whorl of (3–)4–7 smaller glabrous petals. Of all the published descriptions of *Chisocheton*, that of *C. sarasinorum* Harms (Harms, 1937) includes a description of a corolla with three outer and two to three inner petals a little smaller than those of *Megaphyllaea perakensis*. *Chisocheton sarasinorum* was collected by the Swiss zoological cousins Sarasin on their successful north-south crossing of central Sulawesi in 1902. Their collection is the type and is destroyed and no other material from Sulawesi has been seen. However, Harms's excellent description allows no doubt that unnamed sheets collected by Kostermans (Berau, near Teluk Bajur, no. 21585 (SAR!) in neighbouring East Kalimantan and further material from the Sandakan area of

*'Megaphyllaea sp.' of Merrill in *Univ. Calif. Publ. Bot.* **15**: 123 (1929) is a fruiting specimen of *Chisocheton medusae*.

Sabah (*Castro* SAN A43 (K!,SING!); *Ah Wing* SAN 29528 (K!, SAN!)) is conspecific with that of the Sarasins. Harms particularly noted the tough thick staminal tube and the large flower size; further, the shallow calyx, the two rows of petals and the sparsely flowered inflorescences are characteristic of this tree. Recently, fruiting material has been collected by Dr Pennington near Sandakan (no. 7910 (FHO!, SAN!) and by W. Meijer (SAN 34298 (SAN!)). The fruits and seeds very closely resemble those of *Megaphyllaea perakensis*.

In many respects the facies of the inflorescence and flowers of *Chisocheton sarasinorum* resembles that of those of *C. pauciflorus*, an aptly named leptocaul tree of peninsular Malaysia. On examination the corolla of this species is found to comprise an outer whorl of three petals, tomentose outside, and (1–)2–3 marginally smaller inner petals, glabrous except where they protrude between the outer three in bud, where they are marked by a longitudinal band of tomentum. In short, the aestivation of this 'double corolla' is almost indistinguishable from the quincuncial and imbricate conditions of corollas in many other species of *Chisocheton*. Details of the pubescence and obscure lobing of the staminal tube and of the anthers are similar, as is the style, to those of *C. sarasinorum* and *Megaphyllaea perakensis*. The stylehead is subcylindrical to discoid in *Chisocheton pauciflorus* and *C. sarasinorum* and even more pronouncedly discoid in *Megaphyllaea perakensis*, a rather unusual feature in *Chisocheton* where the stylehead is most often cylindrical. In summary, the flowers of *Megaphyllaea perakensis*, *Chisocheton sarasinorum* and *C. pauciflorus* show the transition concomitant with an increase in leptocauly, from a double corolla to a single whorl as in say *C. cumingianus* where the aestivation may be quincuncial, alternative or imbricate.

There seems little reasonable alternative to the transfer of *Megaphyllaea perakensis* to *Chisocheton*; the other course would be to transfer *C. sarasinorum* and *C. pauciflorus* to *Megaphyllaea*. This would demand the wholesale splitting of *Chisocheton*, its sections, e.g. sect. *Clemensia* and sect. *Dasycoleum*, being resurrected to generic status as well as reintroducing the long-sunk genera *Rhetinosperma* Radlk. and *Melioschinzia* K. Schum. and perhaps creating even more new generic names. Besides the abominable nomenclatural upheaval this would initiate, the futility of such action is obvious when the variable nature of other genera in Meliaceae, e.g. *Aglaia* Lour. is considered (Pennington & Styles, 1975). *Megaphyllaea perakensis* is therefore transferred to *Chisocheton* below with a full description of this remarkable local and rarely collected pachycaul tree.

Morphological notes

Growth form

Chisocheton species are typically trees of the understorey of rain forest. Adult trees vary from small undergrowth treelets, some of which are sparsely branched pachycauls as *C. setosus* or weeping leptocauls as *C. sapindinus* to medium-sized leptocaul trees to 39 m and 75 cm d.b.h. in *C. longistipitatus* or 37 m and 150 cm d.b.h. in *C. cumingianus*, though many species, for example *C. patens*, flower when quite small. Larger species have fluted boles, sometimes heavily buttressed as in *C. macrophyllus* where the buttresses may be 3 m high and 2 m out, or have 'stilt roots'.

Such pachycaul species as *Chisocheton tomentosus*, *C. polyandrus*, *C. penduliflorus*, etc. produce flowers when the tree is unbranched (Hallé & Mabberley, 1977). Such 'architecture' corresponds to 'Corner's Model' in the scheme of tree branching drawn up by Hallé & Oldeman (1970). Branching following this flowering comprises 'reiteration' (Oldeman, 1974) and is found in these species. In less pachycaul species, however, flowering is postponed until after branching, whilst the general architecture of the tree is the same, as drawn in Fig. 1, e.g. *C. perakensis*, *C. macrophyllus* (Koorders & Valeton, 1913) and *C. schoddei*, i.e. Champagnat's Model. The more leptocaul species have retarded flowering, e.g. *C. pentandrus*. In the dense ombrogenous crowns of, for example, *C. ceramicus* and *C. lasiocarpus* the sympodial branching is much exaggerated.

Allied to these tall species are undergrowth ones. *Chisocheton setosus* and *C. crustularii* appear to be precocious pachycauls, their foliage resembling that of juvenile forms of their allies *C. tomentosus*, *C. polyandrus*, etc. *C. lasiogynus* seems to be a precocious ally with juvenile foliage of *C. patens* in a more leptocaul group. In the ser. *Schumanniani*, *C. sapindinus* and *C. tenuis* seem to be genuine 'miniatures' for the treelets are weeping leptocauls with small leaves on thin twiggy

Fig. 1 Architecture of *Chisocheton* species. Corner's Model: 1, *C. polyandrus;* 2, *C. tomentosus* with 'reiteration'. Champagnat's Model: 3, *C. macrophyllus;* 4, *C. lasiocarpus.*

branches. It is to be noted that the range of branching and retardation of flowering is to be found within different taxonomic groupings within the genus. For, although all the members of sect. *Clemensia* seem to correspond to Corner's Model, the sections *Dasycoleum*, and *Chisocheton* include a wide range of the degree of branching before flowering. The sect. *Rhetinosperma* comprises similar leptocaul species.

In south-east Asia the subfamily *Melioideae* appears to be rather restricted in its range of growth form. *Vavaea* exhibits *Terminalia*-branching (Pennington, 1969) and *Melia azedarach* L. is also monopodial (Corner, 1940 : 27). Otherwise all the genera of south east Asia appear to follow the same sympodial pattern as *Chisocheton*, which is briefly recorded for *Azadirachta* ('*Melia excelsa*') by Corner (*l.c.*), i.e. it is the model for *Aglaia*, *Aphanamixis*, *Dysoxylum*, *Sandoricum*, *Heynea trijuga* Roxb. ex Sims and *Turraea breviflora* Ridl. Only in *Aglaia* is there so wide a range of the degree of pachycauly and branching as there is in *Chisocheton.*

Corner's Model is to be found in *Guarea richardiana* A. Juss. as well as *Aglaia* (Hallé & Mabberley, 1977). In allied families the Model is found in *Chytranthus*, *Deinbollia*, *Jagera*, *Placodiscus* and *Radlkofera* (Sapindaceae), *Brucea* and *Eurycoma* (Simaroubaceae), but nothing like the unbranched hapaxanthic pachycauls, *Spathelia* (Krause, 1921 '*Sohnreyia*'), from the allied Rutaceae is known in Meliaceae. Champagnat's Model is known from *Guarea guidonia* (L.)

Sleum. ('*G. guara*') and *Turraea heterophylla* Sm. (Hallé & Oldeman, 1970) but is also absent from allied families.

In all the above-mentioned *Chisocheton* species, particuarly the pachycaul ones, the foliage is bunched at the branch-tips; the notable exception is *C. pohlianus* which is a sparsely-branched undergrowth tree. Here the old leaves are retained and resemble branches more than do any other leaves in the genus, for inflorescences are borne on the leaves as in *C. tenuis*. Except for the non-rosetted leaves, the tree otherwise resembles a young form of its allies in ser. *Schumanniani*.

Axis and wood

The leafy twigs vary in diameter from about 1.5 mm in *Chisocheton sapindinus* to about 40 mm in *C. macranthus*. This reflects the wide range of primary body size manifest in the pith diameter and the length of unfurling time of the leaf in the more pachycaul species. Most species have leafy twigs between these extremes and average about 5–6 mm. The bark of the twigs and branches is usually smooth or finely cracked and blackish in colour, the underbark pinkish brown to reddish. Cicatrices are usually conspicuous, particularly in the pachycaul species such as *C. macranthus*, where the scutellar cicatrices may be up to 3 cm long and 2·5 cm wide. Lenticels, conspicuous in *C. cumingianus*, are usually not so in other species.

Twigs, leaf bases and occasionally inflorescences of some trees in the *Chisocheton lasiocarpus* complex, some specimens of *C. ceramicus*, *C. cumingianus*, including subsp. *kinabaluensis*, *C. sarawakanus*, *C. koordersii* and *C. longistipitatus* are inhabited by ants although myrmecophily appears not to be a diagnostic feature of any species. It is noteworthy that the phenomenon is not recorded west of Borneo. Ant species from four genera have been noted by Stevens (1975) in three Papuasian species.

The axis is more or less covered with unicellular hairs in all species, except those of sect. *Rhetinosperma* where they are 4-stellate. Usually small multicellular glandular hairs occur mixed with these. The hairs of sect. *Clemensia* are setose and irritant, those of *Chisocheton setosus* and *C. crustularii* being the largest (2–3 mm long) and 'tinkling' when stroked as first noted by Airy Shaw (1937).

The anatomy of the stem is rather simple and is of a type common in Meliaceae; it does not depart from that recorded by Metcalfe & Chalk (1950 : 349). The pith always contains prosenchymatous sclerenchyma which comprises large groups of cells in *Chisocheton patens* (*Mabberley* 1560) and *C. sarawakanus* (*M.* 1716) and the secondary phloem contains tangential bands of more or less scattered fibres (there is variation in this within species), although apparently absent from *C. macranthus* (*M.* 1718) and *C. polyandrus* (*M.* 1688). The pericycle has a more or less well developed band of groups of fibres, sometimes more or less discrete, but again variable. The cortex has groups of prosenchymatous sclerenchyma with or without small groups of sclereids, which are particularly large in *C. medusae* (*M.* 1680). This species is also notable for the resin-filled parenchyma cells of the wood. Of the species examined, *C. cumingianus* (*M.* 1757), *C. sarawakanus*, *C. patens*, *C. sapindinus* (*M.* 1745), *C. macrophyllus* (*M.* 1546) and *C. macranthus* are devoid of the apparently suberized cells in the pith and cortex of all the other species – *C. ceramicus* (*M.* 1573), *C. lasiocarpus* (*M.* 1751), *C. longistipitatus* (*M.* 1793), *C. montanus* (*M.* 1766), *C. pentandrus* (*M.* 1669), *C. pohlianus* (*M.* 1772), *C. ruber* (*M.* 1635), *C. sayeri* (*M.* 1788), *C. schoddei* (*M.* 1773), *C. tenuis* (*M.* 1765) and *C. tomentosus* (*M.* 1557)); they are particularly noticeable in *C. ruber* where they comprise a conspicuous network.

The wood of the four Javanese species has been examined in detail by Moll & Janssonius (1908) in their account of Meliaceous woods. Metcalfe & Chalk (*l.c.*) and Pennington & Styles (1975) have examined more species and commented on the earlier work, the latter authors stressing the intraspecific variation to be found in this family. My own findings on the species above do not depart from those of these authors. A *précis* is included in the generic description below.

Leaf

The largest leaves in the genus exceed 240 cm in length when shed, as, for example, in *Chisocheton macrophyllus*, and leaves at least 2 m long are known in *C. medusae*, *C. macranthus*, *C. tomentosus*,

C. sarawakanus, *C. pohlianus*, ? *C. lasiocarpus*, *C. perakensis*; there are another 12 species with leaves at least 1 m long. The leaves are up to 28-jugate in *C. macrophyllus* and *C. pohlianus*, but in general, *c.* 12–15-jugate is the range of most species. By contrast, the leaves of leptocaul species such as *C. sapindinus* have at most nine pairs of leaflets and in others, e.g. *C. pauciflorus*, as few as five or *C. curranii* with three (? poor material). The leaflets may all emerge at once as in the imparipinnate species and seedlings, or as in paripinnate forms of *C. patens* or develop in flushes of several pairs at a time (*cf.* Volkens, 1912 : 61), rarely a pair at a time concomitant with the emergence of a new leaf at the stem apex as illustrated for *C. pentandrus* subsp. *paucijugus* ('*C. spicatus*') by Corner (1964 : t. 42). The young leaflets are bright pink in all the species I saw flushing in the field *viz. C. erythrocarpus*, *C. pentandrus*, *C. ceramicus*, *C. patens*, *C. sarawakanus*, *C. macrophyllus*, *C. ruber*, and *C. tomentosus*, though in *C. macranthus* they are certainly plain green. According to Corner (*l.c.*), the leaves of *C. pentandrus* subsp. *paucijugus* develop eight pairs of leaflets over eight seasons before being shed, the older leaflets falling when four or five seasons old.

All *Chisocheton* seedlings seen have unifoliolate leaves in the young stages, e.g. *C. cumingianus* cultivated at Lae (P. F. Stevens, *in litt.*) and *C. medusae* (*Mabberley* 1682). The sequence of build-up of leaves of the seedling of *C. medusae* was as follows: unifoliolate, trifoliolate, imparipinnate with five, seven and nine leaflets, imparipinnate with pseudogemmula and *three* or four pairs of leaflets.

The anatomy of a young leaf rachis has a 5-arch stele but this is consolidated into a cylindrical one in leaves flushing for the first time. The rachis has seasonal increments of growth, seen in the increasing amounts of secondary xylem. In *Chisocheton* species it is not possible to discern the number of seasons' growth from this. Cork is formed, too, as in *Guarea rhopalocarpa* Radlk. (Skutch, 1946). Such accumulation of secondary xylem is not peculiar to this family and is found in other pinnate leaves as in those of *Kigelia* (Bignoniaceae) (Beck, 1970).

The 'ever-growing' leaves are even more unusual in the New Guinea species *Chisocheton pohlianus* and *C. tenuis*, which have epiphyllous inflorescences. The inflorescences are borne on the segment of rachis produced as part of the current flush of leaflets. The inflorescence of *C. pohlianus*, which I have examined in detail, may be unbranched and bearing one or two flowers or with one order of branching and bearing several. The anatomy of the rachis is undisturbed, resembling that of other species, which, as Melville (1962) has pointed out, is like that of a stem. Distal to the inflorescences, the rachis is unthickened and resembles more nearly a 'typical' leaf. In other words, contrary to the views of some workers, e.g. van Steenis (1969), we are not dealing with an adnate inflorescence as in *Gloriosa* (van der Pijl, 1951), where the axis is united to a stem. Indeed, if it were adnate we would have an 'evergrowing' inflorescence as is seen, for example, in *Hoya* (Asclepiadaceae), *Dietes* (Iridaceae), *Couroupita* (Lecythidaceae) and *Phalaenopsis* (Orchidaceae). Vascular strands merely pass from the central stele to an approximately inter-leaflet position. As the 'leaves' of *Chisocheton* defy the rigid 'rules' of morphology derived from temperate plants, so does the course of these vascular strands and the initiation of the meristems they grow to serve.

The leaves of other Meliaceae may be simple, e.g. *Turraea*, unifoliolate as in some *Aglaia* spp., trifoliolate as in *Sandoricum*, pinnate as in most species, or pseudogemmulate as in most species of *Chisocheton*. The pseudogemmula of *Chisocheton* is known in angiosperms only from the closely allied genus *Guarea*. Such apparently indeterminate growth has excited much morphological interest, and it has been suggested that such an arrangement supports the theory of the origin of pinnate leaves from branches (Lam, 1932). Corner (1954) has argued that the indeterminate growth is more archaic than the determinate.

Indeterminate growth of 'leaves' is also to be found in Filices in vascular plants, notably in *Lygodium* and the Gleicheniaceae. Pinnate fronds of some species of *Asplenium* without terminal pinnae, for example *A. sandersonii* Hook., have a subterminal gemma, the apex aborting (Faden, 1973), gemmae appearing elsewhere on the frond or stipe in other species. However, the species *A. mannii* Hook. does have truly indeterminate growing fronds with croziers, but such fronds are distinct from the soriferous ones, giving rise to lateral gemmae in place of pinnae (Faden, 1973). In *Lygodium*, the frond dichotomizes repeatedly. the products growing unevenly and one

overtopping the other, dichotomizing, etc. (Holttum, 1957). In the Gleicheniaceae, the unbranched fronds of *Stromatopteris* are considered advanced when compared with the branched ones of other genera. The periodic dormancy of the 'leaves' of *Dicranopteris* is also to be found in the rhizomes of *Stromatopteris* (Holttum, 1957). Young plants of *Gleichenia glauca* (Thunb.) Hook. have determinate growth and the fronds resemble those of *Cyathea*. Holttum considers the periodic dormancy to be a specialization associated with thicket formation and climbing, the finest example being the 30 m fronds of some forms of *Dicranopteris linearis* (Burm. f.) Underw.

In Meliaceae, the determinate juvenile 'leaves' of *Chisocheton* which are the adult form in the apparently neotenic *C. lasiogynus*, *C. setosus*, etc. seem to be homologous with those of *Dysoxylum* spp., and have the characteristics of the 'universal category leaf'. Those of the adult forms have certain characters of the 'universal category shoot', and those with epiphyllous inflorescences more so, behaving like the branches of those Rubiaceae, e.g. *Lasianthus* spp., which are shed like pinnate leaves. If the only species of *Chisocheton* known were *C. pohlianus*, then perhaps the genus would be considered a 'simple-leaved' Meliacea with branches behaving like those of *Lasianthus*.

Thus, in the ontogeny of *Chisocheton* species, one passes from 'leaf' to quasi-branch, showing that the *Chisocheton* 'leaf' is one of those intermediate organs which defy placing in a pigeon-hole (Sattler, 1967). That this should not be unexpected is shown by the work of Sussex (1955) where, dependent on isolation from the apex, even *Solanum* primordia may develop into centric ('shoot') or dorsiventral ('leaf') organs.

Inflorescence

As with the leaves, the conventional tenets of morphology are again broken, for not only are epiphyllous inflorescences developed, but supra-axillary inflorescences are found in *Chisocheton cumingianus*, *C. schoddei*, etc. In *C. cumingianus*, there is variation in inflorescence position, from axillary to a branch of supra-axillary inflorescences to such a branch in the axils of fallen leaves, in a roughly north-west to south-east direction from China to New Guinea. The Bornean montane populations, subsp. *kinabaluensis*, have cauliflorous branches of inflorescences, a condition always found in *C. ruber*. Ramiflory, of branches or simple inflorescences, is found in some forms of *C. laosensis*, *C. amabilis* and *C. lasiocarpus*, and regularly in *C. lasiogynus* and *C. cauliflorus*.

Variation in inflorescence size within species has been stressed by Stevens (1975). Most species are dioecious, and female trees usually have more sparsely branched inflorescences. The branched inflorescences might be termed thyrses, with subpaniculate branches. Flagelliflory is characteristic of many species in sect. *Clemensia*.

Flower

Although appearing hermaphrodite at a first glance, all individuals, except trees of *Chisocheton cumingianus* and *C. koordersii*, seem to be unisexual, the males with small ovaries and aborted ovules, the females with pollen-less antherodes or, at least, abnormal pollen (Styles, 1972; Stevens, 1975). However, some specimens of *C. cumingianus* seem to be polygamo-dioecious, as was noted by Valeton (in Hochreutiner 1904, as *C. amboinensis*).

The aestivation of the petals may be valvate, alternative, imbricate or quincuncial. This may be manifest only at the tips of the fleshy petals of many species. In *Chisocheton perakensis* and its allies there is a range of conditions from a biseriate to uniseriate corolla – see above. The aestivation is variable in species like *C. cumingianus*, but constant and correlated with characters of the fruit in other parts of the genus, for example ser. *Sandoricocarpi* of sect. *Dasycoleum* and sect. *Rhetinosperma* have valvate aestivation and sarcotestal seeds. However, the other sections, as well as the *C. perakensis* group of sect. *Dasycoleum*, have alternative to imbricate or quincuncial aestivation.

Characters of the staminal tube are useful in ordering the species. Several species have tubes with lobed margins. At anthesis, these lobes are recurved. This feature is characteristic of all species of sect. *Clemensia*, except *Chisocheton medusae*, which has, at most, an undulate margin. Such an unlobed margin characterizes *C. perakensis* and its allies and ser. *Schumanniani* of sect. *Chisocheton*. The lobed tube is found in ser. *Paniculati* of sect. *Chisocheton* (there are rather

crenate margins in *C. laosensis*, *C. sarawakanus* and *C. lasiogynus*), and in the remainder of sect. *Dasycoleum* and in sect. *Rhetinosperma*.

The tube is usually more or less pubescent, but there is considerable intraspecific variation in this. Hairs are found both within and without the tube in sect. *Dasycoleum* ser. *Sandoricocarpi*, and in sect. *Rhetinosperma*, but sparsely, if at all, and then only within, in the *Chisocheton perakensis* group. Elsewhere a glabrous tube is found in *C. medusae* of sect. *Clemensia* and in ser. *Schumanniani*, in some forms of the variable *C. lasiocarpus* complex, *C. novobritannicus* and *C. sapindinus*. Tubes of the rest of the species of ser. *Schumanniani* and of sect. *Chisocheton* and sect. *Clemensia* are pubescent on at least one surface.

The anthers of many species are locellate, unlike any other Meliacea, but resemble those in *Iguanura* (Palmae), *Macaranga* (Euphorbiaceae) as well as *Mkilua* and *Xylopia* (Annonaceae). In *Chisocheton* such locellae are not found in sect. *Rhetinosperma* nor in *C. macranthus*, *C. medusae* and *C. setosus* of sect. *Clemensia*, and are not clear in some forms of *C. sayeri* and other species in sect. *Chisocheton*, though are diagnostic for sect. *Dasycoleum*. Pollen grain diameter varies from 30–105 μm, though there is great intraspecific variation in this, that of *C. macranthus* varying from 70 to 105 μm.

A shallow cupular disk is found in many species in sect. *Clemensia*, in *Chisocheton amabilis* and *C. laosensis* and in some forms of the variable *C. patens* in sect. *Chisocheton; C. pellegrinianus* and *C. vindictae* in sect. *Dasycoleum* and is characteristic of sect. *Rhetinosperma*, but not in any species without a lobed, or at least crenate, margin on the staminal tube.

The stylehead is usually capitate, that of the *Chisocheton perakensis* group is discoid, as is that of *C. medusae*, a character diagnostic of the allied genus, *Guarea*, and found in most species of *Dysoxylum*. It is noteworthy that in these *Chisocheton* species, the staminal tube margin is unlobed. Griffith (1847 : 76) noted that in such cases in *Dysoxylum*, the stigmatic surface is confined to the lower half of the margin of the discoid head, pollen tubes penetrating from the side.

Observations on pollination are sadly lacking. The flagelliflory of sect. *Clemensia* suggests chiropterophily (or perhaps chiropterochory), while the sweet-scented branched inflorescences of sect. *Chisocheton* may indicate entomophily. However, Mr A. Lamb of Sabah (*in litt.* 20.i.76) informs me that the flowers of *C. polyandrus* (sect. *Clemensia*) are visited by the sunbirds known as spiderhunters. It seems not unreasonable to suppose that the fimbriations of the staminal tube, its hairs, position of the anthers, the presence of a disk and the shape of the stylehead, some states of which seem to be correlated as mentioned above, may constitute very exacting 'syndromes' adapted to particular groups of animals, as hinted at by White (1975) in discussing the Hymenoptera which visit *Trichilia havanensis* Jacq. in Mexico.

Fruit and seed

The fruits may be dehiscent or not, those of some species, notably in sect. *Clemensia*, bearing irritant, deciduous, golden-brown hairs on the pericarp. Other species have a glabrous pericarp at maturity, though the young fruit is always hairy. Sometimes the pericarp hairs are of conspicuously different lengths, as in *Chisocheton sayeri* (Stevens, 1975). White latex exudes from the cut fruits and seeds of some species, notably those in sect. *Dasycoleum*, *C. macrophyllus*, *C. sarawakanus* and *C. cumingianus*, though in the last two it is not always present. The fruits are 2–9-locular, and there is some infraspecific variation, sometimes visible on the same tree, in this, though species in sect. *Dasycoleum* ser. *Sandoricocarpi* and sect. *Rhetinosperma* almost always have 2-locular fruits. Occasionally some ovules may abort to give a monospermous fruit. The fruits of certain leptocaul species are prominently beaked at maturity, as, for example, *C. sapindinus* (sect. *Chisocheton*) and *C. pentandrus* subsp. *paucijugus* (sect. *Dasycoleum*), though *C. macranthus* and *C. penduliflorus* (sect. *Clemensia*) and *C. ruber* (sect. *Chisocheton*) pass through such a stage.

The seeds of Meliaceae are extremely diverse in construction (Netolitzky, 1926; Corner, 1976) with intrageneric variation. *Chisocheton*, distinct from the rest of the family in its orthotropous seeds, is no exception. The two most common types, figured in the immature state by Corner (1976, **2** : 324), are the arillate (*C. patens*, '*C. divergens*') and the exarillate (*C. ceramicus*, '*C.

sandoricocarpus'). The seeds vary in size from the small arillate seeds of *C. sapindinus* to the large orange-segment-shaped sarcotestal seeds of *C. medusae*. In sect. *Rhetinosperma*, they (two per fruit) are scutellar and sarcotestal. In the allied sect. *Dasycoleum*, there are similar seeds to these in those species with two seeds per fruit, but in those with larger numbers, e.g. *C. perakensis*, *C. sarasinorum*, they resemble seeds of *C. medusae*. An extended essay on the seeds of Meliaceae is to appear elsewhere, but for the purposes of this account, a few details of the structure are worth noting:

(i) Arillate seeds – All seeds of sect. *Chisocheton* so far known are arillate: *C. lasiocarpus*, *C. macrophyllus*, *C. cumingianus*, *C. patens*, *C. pohlianus*, *C. sapindinus*, *C. sarawakanus*, *C. schoddei*. Those of ser. *Schumanniani* have an (orange-)red aril which edges the brown to black testa. Sometimes, as in *C. schoddei* (*Mabberley* 1773) and *C. cumingianus*, there is a narrow extension to the micropyle. The other species in ser. *Paniculati* have a variable amount of arillate tissue, sometimes almost enveloping the testa, as in *C. cumingianus* (*Pennington* 8052), leaving a small bare area around the micropyle; there is often less aril tissue in this species. The aril is rich in oil and is attached to a swollen funicle–hilum region. As the funicle and hilum are not distinct from one another in these orthotropous seeds, nothing can be gained by speculating on the precise origin of the aril (Corner, 1976, **1** : 187; *cf.* Endress, 1973). Except that these seeds are orthotropous, they resemble those of *Dysoxylum cauliflorum* Hiern (Corner, 1976, **2** : 325) in that the seed is enclosed, except at the chalaza in a tough lignified exotegmen. Lying within this are vascular bundles sometimes associated with laticifers (in *C. cumingianus* and *C. macrophyllus*, but not constantly so), and occasionally with large knots of sclereids (e.g. *C. macrophyllus*). *C. granatum* fits this group on floral characters and has a similar structure in its testa and tegmen, but has no aril.

(ii) Exarillate seeds – These differ entirely in their construction, a young specimen of *Chisocheton ceramicus* being figured by Corner (1976) and a maturer seed of this type is figured by Pennington & Styles (1975 : t. 16) for *Guarea excelsa* Kunth. The lignified exotegmen of the arillate seeds is not to be found, and the construction of the seed-coat is entirely pachychalazal, like the bulk of that in *Aphanamixis grandifolia* Blume figured by Corner (1976, **2** : 322).

In sect. *Clemensia*, besides the sarcotestal seeds of *Chisocheton medusae*, which are heavily vascularized, there are arillate seeds. A species which is often confused with *C. medusae* in flower, *C. macranthus*, is arillate, but has a tough but unlignified tegumen unlike other arillate seeds in *Chisocheton*. Similarly, *C. tomentosus*, with sarcotestal seeds, is readily confused in flower with *C. polyandrus* which has arillate seeds of the standard type.

There are indications that the sarcotestal seeds are associated with tardy dehiscence of the fruit, the seeds being exposed on impact of the fruit falling on the ground, or even later, as seems to be the case in *Chisocheton medusae* and *C. tomentosus*. By contrast, the arillate seeds are exposed by the splitting of the pericarp on the tree, e.g. *C. macranthus*, *C. polyandrus*. It is to be noted that in these species pairs, the latter have extremely long peduncles (sometimes a few metres long), whilst the former are very much shorter. The long peduncle is also to be found in *C. penduliflorus*, which has arillate seeds. Again, those arillate species in sect. *Clemensia* have 'reversed' fruits, such that when their fruits split on the tree, they present their seeds at right angles to the peduncle, i.e. not hanging down for ready deciduousness, but ready for animals mobile at around that height. The fruits contain no alkaloids as far as is known (see Stevens, 1975), though their bright colours may be mimicking 'warning colours', warding off overindulgent 'wrong' dispersal agents. Collectors have noted that the sarcotestal seeds of *C. tomentosus* and *C. medusae* are eaten by 'squirrels', but whether this was on or off the tree has not been recorded.

Chromosomes

There are few counts, and my efforts to obtain more were frustrated by the death of seeds and seedlings in the fuel crisis of 1974–75. *Chisocheton cuningianus* subsp. *balansae* has n = 23 (Mehra *et al.*, 1972, '*C. paniculatus*') and *C. lasiocarpus* ('C. sp. LAE 46746') has 2n = 46, while the type

subspecies of *C. cumingianus* has 2n = 94 (Khosla & Styles, 1975). Polyploid series within genera of Meliaceae are now well known, and intraspecific cytodeme series of the *C. cumingianus* type are also known in *Aphanamixis* (Styles & Vosa, 1971; Styles & Khosla, 1976).

Relationships and infrageneric classification

The genus falls into four sections on characters of the fruit and indumentum when considered in concert with those of the flower, *viz.* sect. *Chisocheton* with arillate seeds, simple hairs and alternative to imbricate aestivation of the petals; sect. *Dasycoleum* with sarcotestal seeds, simple hairs and alternative to valvate aestivation of the petals; and sect. *Rhetinosperma* with sarcotestal seeds, stellate hairs and valvate aestivation, probably a derivative of sect. *Dasycoleum*. The fourth, sect. *Clemensia*, with the large multipetalled, apparently most primitive flowers has a range of fruit-form from arillate to sarcotestal (see above). This variation which separates sections in other parts of the genus is associated with floral homogeneity, suggesting that sect. *Clemensia* may represent the relics of the proto-*Chisocheton* stock which gave rise to the two major lines in the genus.

Sect. *Chisocheton* is divisible into two series, species with an entire staminal tube margin and a peripheral aril comprising ser. *Schumanniani*, those with a fimbriate tube and variable aril comprising ser. *Paniculati*. The species *Chisocheton laosensis*, *C. ruber*, *C. sarawakanus* and *C. lasiogynus* link the two groups but are placed in ser. *Paniculati* for convenience. Sect. *Dasycoleum* is also divisible into two series; species with valvate aestivation and two-seeded fruits comprising ser. *Sandoricocarpi*, the remainder with opposite or alternative or imbricate aestivation and two-to-several-seeded fruits making up ser. *Pauciflori*. Again the two series are linked, by *C. grandiflorus* and *C. mendozai*, which are here placed in ser. *Pauciflori*.

Natural key to infrageneric groupings

Pachycaul treelets or trees, indumentum of long simple trichomes, inflorescences usually unbranched, fruit armed with irritant hairs	sect. *Clemensia*
Not this combination of characters	
Seeds arillate	sect. *Chisocheton*
Staminal tube entire	ser. *Schumanniani*
Staminal tube lobed	ser. *Paniculati*
Seeds sarcotestal	
Trichomes simple	sect. *Dasycoleum*
Aestivation opposite to imbricate	ser. *Pauciflori*
Aestivation valvate	ser. *Sandoricocarpi*
Trichomes 4-stellate	sect. *Rhetinosperma*

It is to be noted that the presence of a disk, a character which is said to separate *Dysoxylum* from *Chisocheton*, is found in *C. patens*, *C. setosus*, sect. *Rhetinosperma*, etc. Further, the paripinnate leaves of *C. patens* approach the condition of many *Dysoxylum* species, as do the imparipinnate ones of *C. setosus*, *C. crustularii* and *C. lasiogynus*. That some *Chisocheton* species have discoid styleheads and/or alocellate anthers emphasizes that the genera can only be separated when a complex of characters associated with floral and vegetative features is considered. At present, however, the orthotropous ovules and seeds of *Chisocheton* seem absolutely diagnostic. Nevertheless, '*Dysoxylum*-ness' is approached in various parts of the genus, particularly strongly in sect. *Rhetinosperma* which has leaves resembling *Dysoxylum* in the weakly developed pseudogemmula, where most of the leaflets are formed at once, disks, and stellate hairs known in some *Dysoxylum* species. *Dysoxylum* is held together as a genus on its disk, but is so variable in fruit, that it may possibly be polyphyletic, its sections deriving, with sect. *Rhetinosperma*, from a variable proto-*Chisocheton* ancestry.

Types of species and their variation patterns

Distribution maps of the 47 named species have been prepared, plotting records by degree-squares, and the ratio of endemic to recorded species for each island, island group or continent

is shown in Fig. 2. No fewer than 34 species are restricted to one such unit and of these, 14 are very restricted indeed, some being known only from the type gathering. Borneo and New Guinea have the greatest concentrations of both endemic species and species recorded, with the Malay Peninsula, Sumatra and the Philippines with smaller but considerable concentrations. Borneo, with the Malay Peninsula, is the centre of diversity of sect. *Clemensia* and ser. *Paniculati*, New Guinea being that of sect. *Rhetinosperma* and ser. *Schumanniani*. Of the ten species recorded from,

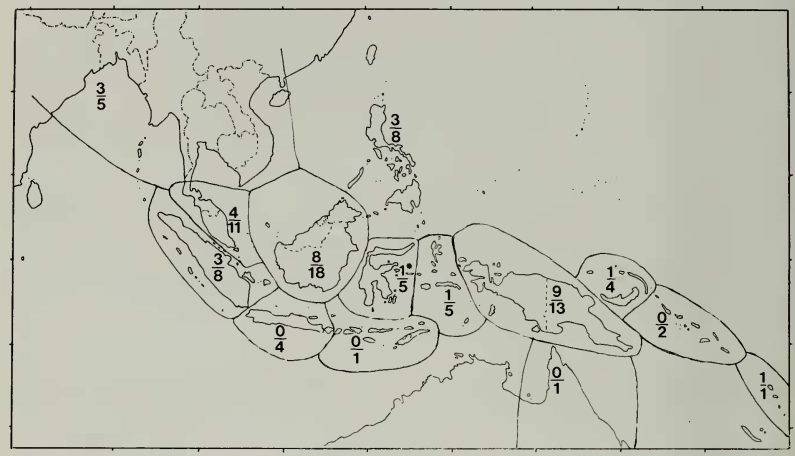

Fig. 2 $\frac{\text{Endemic species}}{\text{Species recorded}}$ of *Chisocheton*.
*$\frac{2}{6}$ if *C. warburgii* included.

but not restricted to, Borneo, one of three species is common to Borneo and each of the Malay Peninsula, the Philippines and Sulawesi, the remaining species having wider distributions, two with the Malay Peninsula and Sumatra and one with the Malay Peninsula and Java, while the last four are very widespread in Malesia, two of them extending beyond Sulawesi to New Guinea. Of the other two non-endemic species recorded from New Guinea, one occurs in the Moluccas, the other extends to Australia.

Of the very restricted species, only *Chisocheton ruber* has any claim to an obvious ecological 'preference', being endemic to the Sarawak limestones near Kuching. Of the more widespread species, *C. amabilis* is restricted to freshwater peatswamp forests of Borneo, Sumatra and the Malay Peninsula, while *C. erythrocarpus* is almost restricted to the coastal forests of the Malay Peninsula and northern Borneo. Of the widespread species with no obvious edaphic and climatic restrictions within Malesia, *C. ceramicus* is more or less uniform from the Malay Peninsula to New Britain, whereas *C. macrophyllus*, *C. cumingianus* and *C. pentandrus* are best divided into geographical subspecies, which in the last is associated with distribution in two forest-types. The remaining three species of the genus, *C. sarawakanus*, *C. patens* and *C. lasiocarpus*, exhibit variation which is not readily correlated with geographical or ecological variables, and exhibit a perplexing checkerboard variation, which is most apparent in *C. lasiocarpus* of ser. *Schumanniani*. The situation in *C. patens*, and to a lesser extent in *C. sarawakanus*, is rather similar (see enumeration for details). Ser. *Schumanniani* is centred on New Guinea and its surrounding islands, but *C. cauliflorus* is restricted to the Philippines, *C. celebicus* to Sulawesi and *C. aenigmaticus* to

Sumatra. The fruit of these three species is unknown, however, and they may therefore be referable to another grouping. Most of the species in the series are clearcut and homogeneous. However, at the heart of this group is a cluster of closely related species, the variation patterns of which have been analysed by Stevens (1975). In Stevens's treatment there are 18 Papuasian species referable here. Of these, *C. schoddei*, *C. tenuis*, *C. montanus*, *C. pohlianus*, *C. novobritannicus*, *C. glirioides* and *C. sapindinus* are clearcut and distinct, and *C. sayeri* is readily separable from the rest. The remaining ten taxa comprise one of the most complex problems in the taxonomy of the genus.

Of these ten species, I have been able to study the material cited from LAE by Stevens, as well as the holdings at BP, E, FHO, G, K, L, LE, SING, U and extra material kindly sent from A by Dr Stevens; in addition I have had the opportunity to study populations of three of the species at several localities in Papua New Guinea.

At any one locality, there may be two or more apparently distinct taxa of trees: Stevens (1975 : 6) has afforded these entities specific rank stating 'on the mainland there are groups of specimens which can be recognized and characterized'. For example, in the Gogol Valley near Madang, Papua New Guinea, trees corresponding typologically to *Chisocheton schumannii* (*Mabberley* 1747, 1754) may be found growing within a few metres of trees corresponding to *C. trichocladus* as defined in Stevens's treatment (*Mabberley* 1751, 1753). Now, if the distribution of '*C. trichocladus*' is considered, it is found that it is very wide and apparently disjunct, occurring on the islands off Irian Jaya and the adjacent mainland, and scattered north-eastwards to Madang; moving eastward it is next to be found in New Britain and Bougainville and Choiseul in the Solomon Islands. In these eastern localities '*C. trichocladus*' seems to intergrade with the local forms of *C. schumannii* or *C. weinlandii* (Stevens, 1975 : 42, 49). The typological species is thus difficult to marry with a biologically meaningful one. The distinctions between the east Papuasian taxa also break down in Irian Jaya and the Moluccas. On the Vogelkop, specimens intermediate between *C. lasiocarpus* and *C. pachyrhachis* (Stevens, 1975 : 16) are found and other specimens cited by van Steenis (1961) as well as Seram material approach *C. weinlandii* or *C. schumannii*. In West Sepik, a specimen intermediate between *C. formicarum* and *C. schumannii* is known (Stevens, 1975 : 12). *C. caroli* is known from three collections in the Sepik area, but if the distinctions between *C. trichocladus*, *C. schumannii*, *C. weinlandii* and *C. pachyrhachis* are not maintained, it too falls into this complex, as do (*e descr.*) *C. lamekotensis* and perhaps *C. oreophilus*, as well as *C. versteegii*, *C. biroi*, *C. ledermannii* and *C. schlechteri* which are linked to *C. trichocladus* by material from Western District, Papua.

Stevens (1975 : 5) suggests that 'although a number of taxa recognized [in his review] are clearcut, the status of others must be considered as uncertain and these might well, in a monograph of the genus, be considered synonyms of a widespread variable species', and compares that move with the treatment of *Vavaea amicorum* Benth. (Meliaceae) by Pennington (1969), where 21 species were reduced to one variable one.

In *Vavaea amicorum*, variation patterns were found to be repeated in the Philippines, New Guinea, the Solomons and Fiji. Pennington continues, 'A botanist who was acquainted with *Vavaea* only in part of its range, e.g. in New Guinea, in the Solomon Islands, or Fiji Islands, would be justified in assuming that distinct subspecies or even species could be recognized'. He cites apparently distinct taxa in the Solomons but continues, 'But elsewhere, especially in the Philippines, these distinctions break down, since the characters vary independently there giving rise to many intermediates'. He chooses not to recognize subspecies or varieties within the group which he treats as one species, because (1) none of the variants is sufficiently well correlated with geography and there is no true geographical replacement; such phenetic 'splitting' would result in an infraspecific hierarchy like that made by Brenan & Brummitt (1965) for *Dichrostachys cinerea* (L.) Wight & Arnott, criticized by White (1971); (2) different variants frequently occupy not only the same locality but also the same habitats; (3) most variants are based on slight, often single, vegetative differences. He also notes that some of the most striking variants appear to have evolved polytopically. A similar situation is known in *Stachys aculeata* Hook. f. (Labiatae) (Björnstad *et al.*, 1971).

In the *Chisocheton lasiocarpus* complex, Pennington's conditions are satisfied. Following

Stevens's suggestion, I therefore amalgamate the nine species mentioned above, and using Pennington's criteria, I choose not to recognize formal infraspecific taxa. This leaves *C. novoguineensis*, which is known from comparatively few specimens and lies close to the '*C. weinlandii*' area of *C. lasiocarpus*, 'narrow-flowered specimens of the former [*C. weinlandii*] being especially difficult to distinguish from the latter [*C. novoguineensis*]' (Stevens, 1975 : 51). *C. novoguineensis* is a plant of hill or lower montane rain forest of the south of Morobe District and the Central District of Papua New Guinea. Further collecting in these areas may show that it is ecologically isolated from the rest of the complex, in which case subspecific rank might be appropriate for this tree. For the present, I leave it as part of the variable *C. lasiocarpus* complex.

To amalgamate the ten 'species' may seem an abrupt move, and without qualification as in some recent revisions, e.g. *Lobelia nicotianifolia* Roth ex Roemer & Schultes (Moeliono, 1960; *cf.* Mabberley, 1974), would lose, in my opinion, much valuable information in this interesting evolutionary situation. Other workers have used the concept of 'entities' for locally more or less well defined and recognizable forms, e.g. *Lepisanthes tetraphylla* (Vahl) Radlk. (Sapindaceae) – 47 entities (Leenhouts, 1969). An alternative approach is to afford such variants varietal status as successfully executed by Corner (1969) for the variable *Ficus deltoidea* Jack (Moraceae), and not using the subspecies, for 'geographical limits are not exactly known and to stretch the meaning of subspecies to include ecological separation *would also imply more knowledge than there is*' [my italics]. An intermediate solution has been sought by Jacobs (1962) for the widespread Malesian *Pometia pinnata* J. R. & G. Forster (Sapindaceae) which he presented as a number of forms, paramorphs, etc. The informal method has the advantage of no nomenclatural validity (Burtt, 1970): I have found it useful to employ it in the description of the local variants of *Senecio johnstonii* Oliv. (Compositae) in the Rwenzori range of east Africa (Mabberley, 1973).

Evolutionarily speaking, we may have in the *Chisocheton lasiocarpus* complex a series of semi-species, but as variation cannot yet be correlated with environmental parameters, geographical or ecological, as has been done for *Syzygium* (Myrtaceae) and *Parinari* spp. (Chrysobalanaceae) in Africa (White, 1978), this situation cannot be accommodated in the static, almost anti-evolutionary, straitjacket of a formal hierarchy. In many respects, we seem to have an 'ochlospecies' (White, 1962) first described in African *Diospyros* spp., and, although one might hesitate to use this term as it may be so easily misused to cloak ignorant 'lumping', I do so with some conviction, having the critical analysis of Stevens (1975) as evidence for this view.

I propose, therefore, to give the oldest name, *Chisocheton lasiocarpus*, to the complex and to suggest that workers dealing with apparently discrete morphological entities at the local level may use those names as described by Stevens in his review. These variants may be keyed out as below, although intermediate forms are plentiful.

Chisocheton lasiocarpus is close to the variable *C. sayeri* and the link seems to be *C. pilosus*. Stevens has reduced this to varietal status in *C. sayeri*, but as it is still known from the type gathering only, and as it appears to be a link, I propose leaving it at specific rank for the time being.

Enumeration

Generic description

CHISOCHETON Blume

Blume, *Bijdr.* **1** : 168 (1825); Schult. & Schult., *Syst.* **7** : 83 (1829); A. Juss., *Mém. Mus. Hist. Nat.* **19** : 73 (1830 ?); G. Don f., *Gen. Syst.* **1** : 685 (1831); Meisner, *Gen* : 48, 35 (1837); Steud., *Nomencl.* ed. 2 : 352 (1840; 'Chisogeton'); A. Juss. in d'Orbigny, *Dict. Hist. nat.* **8** : 80 (1849, 'Chizocheton'); Miq., *Fl. Ind. Bat.* **1** (2) : 527 (1859) & supp. **1** : 504 (1861); Benth. & Hook f., *Gen. Plant.* **1** : 333 (1862); Baillon, *Hist. Pl.* **5** : 504 (1874); Hiern in Hook. f., *Fl. Br. India* **1** : 550 (1875); C. DC. in DC., *Monog. Phan.* **1** : 528 (1878); Boerl., *Handl. Fl. Ned. Ind.* **1** : 190 (1890); King in *J. As. Soc. Bengal* **64** (2) : 24 (1895); Koord. & Val., *Bijdr. Boom.*: 96 (1896); Harms in Engl. & Prantl, *Nat. Pflanzenfam.* III, **4** : 294 (1896); Pierre, *Fl. for. Cochinch.* **5** : t. 346–347 (1897); Pellegr. in *Lecomte, Fl. Indoch.* **1** : 735 (1911); Ridley, *Fl. Malay Penin.* **1** : 386 (1922); Elmer, *Leafl. Philip. Bot.* **9** : 3341 (1937); Harms in Engl. & Prantl, *op. cit.*, ed. 2, **19b1** : 150 (1940); Pellegr. in Humbert, *Suppl. Fl. Gén. Indoch.* : 691 (1946); Bakker & Bakh., *Fl. Java* **2** : 124 (1965); Stevens in *Contrib. Herb. Austr.* **11** : 2 (1975) [See also *Handb. Flora of Papua N.G.* **1** : 135–174 (1978).]; Pennington & Styles in *Blumea* **22** : 497 (1975).

Type species: *C. patens* Blume, selected by Airy Shaw (1937). Airy Shaw's selection of the type (of the type section, 'Euchisocheton'), antedates Harms's selection (1940) of *C. divergens* Blume.

Schizochiton Sprengel, *Syst.* **4** (2) : 251 (1827); Walp., *Rep.* **1** : 429 (1842); M. J. Roemer, *Synops.* **1** : 102 (1846); Endl., *Gen.* : 1049 (1840); Miq., *Ann. Mus. Bot. Lugd.* **4** : 26 (1868). Type: *S. patens* (Blume) Sprengel.

Dasycoleum Turcz. in *Bull. Soc. Nat. Mosc.* **31** : 414 (1855); Benth. & Hook. f., *tom. cit.* : 335 (1862); Baillon, *tom. cit.* : 499 (1874); C. DC., *tom. cit.* : 539 (1878).
Type (obligate lectotype): *D. philippinum* Turcz. = *C. pentandrus* (Blanco) Merr.

[*Diplotaxis* Wall. ex Kurz, *Rep. Veg. Andam.* ed. 2 : 33 *nom. in synon.* (1870), *non* DC. (1821, Cruciferae), *sphalm. pro Plagiotaxis* Wall. ex Kuntze (1891) = *Chukrasia* A. Juss.]

Megaphyllaea Hemsley in Hook., *Ic. Pl.* [18] t. 1708 (1887); King in *J. As. Soc. Bengal* **64** (2) : 24 (1895); Harms in Engl. & Prantl, *Nat. Pflanzenfam.* III, **4** : 290 (1896); Ridley, *l.c.* (1922); Harms in *op. cit.*, ed. 2, **19b1** : 155 (1940); Pennington & Styles, *op. cit.*: 498 (1975).
Type (obligate lectotype): *M. perakensis* Hemsley = *C. perakensis* (Hemsley) Mabberley.

Melio-Schinzia K. Schum. in K. Schum. & Hollr., *Fl. Kaiser Wilh. Land* : 62 (1889); Boerl., *Handl. Fl. Ned. Ind.* **1** (2) : 676 (1890).
Type (obligate lectotype): *M. macrophylla* K. Schum. = *C. lasiocarpus* (Miq.) Valeton ('*C. schumannii* C. DC.').

Rhetinosperma Radlk. in Engl. & Prantl, *Nat. Pflanzenfam.* Nachtr. 3, Ergänzungsheft **2** (3) : 204 (1907) [Sapindaceae]; Harms, *tom. cit.* : 166 (1940).
Type (obligate lectotype): *R. longistipitata* (F. M. Bailey) Radlk. = *C. longistipitatus* (F. M. Bailey) L. S. Smith.

Clemensia Merr. in *Phil. J. Sci.* **3** : 143 (1908) and *Enum. Phil. Flow. Pl.* 2 : 371 (1923); Harms, *tom. cit.* : 155 (1940), *non Clemensia* Schlechter (1915) = *Clemensiella* Schlechter (Asclepiadaceae).
Type (obligate lectotype): *Clemensia macrantha* Merr. = *Chisocheton macranthus* (Merr.) Airy Shaw.

Trees, unbranched, branched low down or, usually, with trunk and sympodial crown, pachycaul to leptocaul, buttressed or not, sometimes laticiferous or myrmecophilous, very rarely foetid, dioecious (apparently sometimes polygamous). *Indumentum* usually of simple, rarely 4-stellate, hairs, sometimes irritant, mixed with small glandular hairs. *Wood* soft with septate fibres and frequently silica deposits; *vessel-elements* solitary or in radial rows, 60–180 μm diam. *Leaves* pinnate, pseudogemmulate, or sometimes imparipinnate, very rarely paripinnate, to 2·4 m long; leaflets in 2–28 pairs, usually opposite, rarely subalternate near leaf base, usually pink when young. *Inflorescence* paniculate, sometimes with long peduncle and then thyrsoid or subracemose, axillary to supra-axillary, ramiflorous or rarely borne on congested cauliflorous branches, or epiphyllous. *Flowers* unisexual, very rarely apparently hermaphrodite, usually bracteolate, articulated with pedicel or inflorescence branches, sometimes with elongated receptacle ('pseudopedicel'); *calyx* ± cupuliform, obscurely, rarely markedly, 3–6-lobed, sometimes closed in bud and splitting irregularly at anthesis when circumscissile at the base; *petals* (3–)4–6(–14), in 1(–2) whorls, free, imbricate, quincuncial or alternative, often merely at apices, or valvate, occasionally separating from one another on drying, rarely weakly united below or united at the base to staminal tube, white or pink (to claret); *tube* cylindrical, sometimes weakly expanded or contracted at the mouth, with an entire to crenate margin, or topped by 4–10(–30) emarginate, truncate or narrowly lanceolate 2(–3)-fid appendages, usually reflexed at anthesis; *anthers* (3–)4–10(–30), usually attached within the tube when completely included or partly exserted, hairy or glabrous, usually locellate, alternating with the lobes or appendages; *antherodes* very slender, indehiscent, without pollen; *pollen grains* 3–5-colporate, oblate-spheroidal or spheroidal with smooth or scabrous exine thickened at the apertures; *disk* usually absent, if present narrowly or broadly stipitate, annular or patelliform, occasionally lobed; *ovary* 2–8-locular, loculi with 1(–2) collateral or superposed orthotropous ovules; *stylehead* capitate, clavate or discoid; *pistillode* slender, base unexpanded, ovules minute or wanting. *Fruit* a 2–5(–8)-valved loculicidal capsule, often stipitate, sometimes rostrate, the valves 1(–2)-seeded; *pericarp* usually leathery or almost completely lignified, sometimes with soft spongy mesocarp or laticiferous. *Seeds* obovoid-spheroid to scutelliform or orange-segment-shaped, variously arillate or sarcotestal, orthotropous; *hilum* often large, heavily vascularized, whitish; *aril* reddish-orange with ± free flap over black testa; *sarcotesta* red, tough; *cotyledons* collateral, oblique or superposed. *Germination* semihypogeal (Ng, 1978).

Artificial key to the species

1. Leaves paripinnate, without pseudogemmula — 29. **patens** (p. 350)
1. Leaves imparipinnate or pseudogemmulate — 2
2. Inflorescences epiphyllous (New Guinea) — 3
3. Leaves ± densely pubescent, petiolules 3–6 mm long — 13. **pohlianus** (p. 331)
3. Leaves sparsely hairy to subglabrous, petiolules (5–)10–23 mm long — 9. **tenuis** (p. 330)
2. Inflorescences axillary, ramiflorous or from bosses — 4
4. Inflorescences borne on long-lived bosses on bole (Borneo) — 5
5. Leaflets strongly asymmetric, petals 5–6, red, anthers 8–10 (limestone) — 22. **ruber** (p. 342)
5. Leaflets not so, petals (3–)4(–5), white, anthers 6–9 (mountains) — 28. **cumingianus** (subsp. **kinabaluensis**) (p. 349)
4. Inflorescences ramiflorous, axillary, supra-axillary or in axils of unexpanded leaves — 6
6. Pseudopedicel *c.* 10 mm long, calyx with conspicuous annular thickening, petals 6–10 in two whorls (Maxwell's Hill, W. Malaysia) — 32. **perakensis** (p. 356)
6. Pseudopedicel, if present, much smaller — 7
7. Calyx (10–)13–20(–23) mm tall (Borneo & Philippines) — 8
8. Leaflets ± densely fulvescent abaxially, inflorescence to 30 cm, petals 9–14, anthers 15–20, stylehead discoid, seeds sarcotestal — 2. **medusae** (p. 322)
8. Leaflets not so, inflorescence to 220 cm, petals 6–10, anthers 16–30, stylehead capitate, seeds arillate — 1. **macranthus** (p. 320)
7. Calyx smaller — 9
9. Leaves imparipinnate — 10
10. Leaflets subglabrous abaxially (Sumatra, ? Java) — 24. **lasiogynus** (p. 343)
10. Leaflets golden-to brown-pubescent, pilose or strigose adaxially — 11
11. Anthers 3–5, corolla clavate in bud (Malay Peninsula) — 5. **penduliflorus** (p. 326)
11. Anthers 6 or more — 12
12. Petals 16 mm long (Borneo) — 6. **crustularii** (p. 327)
12. Petals 20 mm or longer — 13
13. Leaflets rugose, surface strongly reticulate-areolate abaxially, shiny and glabrous adaxially save brown-tomentose midrib; seed sarcotestal (Malay Peninsula) — 3. **tomentosus** (p. 323)
13. Leaflets smooth, abaxial surface not strongly reticulate-areolate; seeds arillate or unknown (Borneo) — 14
14. Leaves strigose with 'tinkling' (when stroked) hairs, petals glabrous — 7. **setosus** (p. 327)
14. Leaves appressed hirsute abaxially, glabrous or sparsely pubescent on veins adaxially, petals densely pubescent outside — 4. **polyandrus** (p. 324)
9. Leaves pseudogemmulate
15. Petals 26–37 mm long, pachycaul treelets with irritant fruit hairs — 16
16. Anther connective glabrous, seeds sarcotestal (Malay Peninsula) — 3. **tomentosus** (p. 323)
16. Anther connective hairy, seeds arillate (Borneo) — 4. **polyandrus** (p. 324)
15. Petals smaller, fruit unarmed — 17
17. One or more petals narrower than and enclosed by the others — 18
18. Leaves tawny pubescent abaxially, tube pilose outside (Burma & Thailand) — 36. **grandiflorus** (p. 358)
18. Leaves glabrescent abaxially — 19
19. Petals *c.* 8 mm long (Sumatra) — 35. **diversifolius** (p. 358)
19. Petals 14 mm long or longer — 20
20. Costae *c.* 5–8 on each side of leaflet midrib, leaves to 38 cm (Malay Peninsula) — 34. **pauciflorus** (p. 357)
20. Costae *c.* 15 on each side of leaflet midrib, leaves to 150 cm (Borneo & Sulawesi) — 33. **sarasinorum** (p. 356)
17. Petals ± same width — 21
21. Tube not conspicuously lobed or strongly crenulate (if unclear, follow alternative) — 22
22. Calyx 5·0–6·5 mm tall (New Guinea) — 8. **schoddei** (p. 329)
22. Calyx up to 4 mm tall — 23
23. Tube villous or sericeous outside — 24
24. Anthers 8 (Philippines) — 10. **cauliflorus** (p. 330)

24. Anthers (3–)4–6 25
25. Petals 5 (Sumatra) 17. **aenigmaticus** (p. 338)
25. Petals (3–)4 26
26. Petals glabrous, leaflets tomentose abaxially (Sulawesi) 18. **celebicus** (p. 338)
26. Petals ± hirsute outside 27
27. Petals (3–)4, 7 mm long, ovary 4-locular (New Guinea) 12. **montanus** (p. 331)
27. Petals 4, much longer 28
28. Ovary bilocular, seeds 2, arillate 23. **sarawakanus** (p. 342)
28. Ovary 5-locular, seeds exarillate 31. **granatum** (p. 354)
23. Tube ± glabrous or sparsely hairy in middle or distal half outside 29
29. Inflorescence villous, to 80 cm, calyx 1·5–2·0 mm tall, anthers 8–9, petiolules *c.* 12 mm (New Britain) 11. **novobritannicus** (p. 331)
29. Not this combination of characters 30
30. Flower buds less than 1·5 mm diam. (New Guinea) 31
31. Leaves with conspicuous venation on both sides (dry) coriaceous, glabrescent; petals *c.* 13·5 mm long, fruit rostrate 20. **sapindinus** (p. 340)
31. Leaves different, fruit not rostrate 32
32. Petals *c.* 12 mm long, flowers crowded towards distal end of inflorescence, fruit spherical 19. **glirioides** (p. 340)
32. Petals up to 10 mm long, or if slightly longer, then tube villous within and leaves pilose abaxially 33
33. Flower buds 9–10 mm long, anthers 4–6(–7), style to 0·15 mm diam. 16. **sayeri** (p. 337)
33. Flower buds *c.* 11·5 mm long, anthers 6–8, styles 0·25 mm diam. 15. **pilosus** (p. 337)
30. Flowers larger 34
34. Inflorescences borne on supra-axillary branch resembling supra-axillary inflorescence, petiolules fulvous tomentose, disk 1 mm tall (Moluccas & ? Laos) 21. **laosensis** (p. 341)
34. Inflorescences different; disk 0 14. **lasiocarpus** (p. 333)
21. Tube conspicuously lobed 35
35. Inflorescences borne on supra-axillary branch resembling supra-axillary inflorescence, petiolules fulvous tomentose (Moluccas & ? Laos) 21. **laosensis** (p. 341)
35. Inflorescences different 36
36. Hairs simple 37
37. Corolla aestivation imbricate 38
38. Costae 15–22 on each side of leaflet midrib, flower buds clavate, anthers 3–5, pachycaul treelet (Malay Peninsula) 5. **penduliflorus** (p. 326)
38. Not this combination of characters 39
39. Ovary 4-locular, seeds (3–)4 40
40. Disk prominent, subtubular to 1 mm 41
41. Calyx 4–5-lobed, petals 5–6, anthers scarcely locellate 25. **amabilis** (p. 344)
41. Calyx margin entire, petals (3–)4(–5), anthers locellate 28. **cumingianus** (p. 347)
40. Disk obscure 42
42. Anthers 2·5 mm long, glabrous 26. **macrophyllus** (p. 345)
42. Anthers 1·5 mm long, hairy 27. **dysoxylifolius** (p. 346)
39. Ovary 2-locular, seeds 2 43
43. Disk present 44
44. Venation very prominent on both sides (dried), seeds 3 cm diam. (Borneo) 30. **lansiifolius** (p. 352)
44. Venation and seeds different 29. **patens** (p. 350)
43. Disk 0 45
45. Petals 18 mm long (Philippines) 37. **mendozai** (p. 359)
45. Petals shorter 46
46. Tube crenate, anthers hairy 23. **sarawakanus** (p. 342)
46. Tube lobes long-triangular, anthers glabrous 29. **patens** (p. 350)
37. Corolla aestivation valvate, seeds sarcotestal 47
47. Disk present 48
48. Tube pubescent on both sides, calyx *c.* 6·5 mm diam. (Sumatra) 38. **vindictae** (p. 359)
48. Tube glabrous within, calyx *c.* 3·0 mm (Vietnam) 42. **pellegrinianus** (p. 366)
47. Disk 0 49

49. Twigs subglabrous 50
50. Petals 13–19 mm long, 2 mm wide in panicles, tube-lobes ± truncate, fruit 4·5 cm diam. or more 39. **ceramicus** (p. 361)
50. Petals 8–12(–19) mm long, only in panicles if flowers small, tube lobes ± laciniate; fruit to 2·1 cm diam. 41. **pentandrus** (p. 363)
49. Twigs fawn-pubescent 51
51. Petals 16 mm long (Philippines) 40. **curranii** (p. 363)
51. Petals 9–13 mm long (Malay Peninsula & Borneo) 43. **erythrocarpus** (p. 368)

36. Hairs stellate, disk present, seeds sarcotestal (Borneo eastwards) 52
52. Inflorescence axes slender (*c.* 1 mm), calyx *c.* 4 mm diam., petals 10 mm long (New Hebrides) 45. **rex** (p. 369)
52. Inflorescence axes stouter, calyx smaller 53
53. Flowers 11–12 mm long (Borneo, Sulawesi) 44. **koordersii** (p. 368)
53. Flowers less than 8 mm long 54
54. Inflorescence velutinous, style glabrous (New Guinea) 46. **stellatus** (p. 371)
54. Inflorescence subglabrous, style densely hairy 47. **longistipitatus** (p. 371)

N.B. The insufficiently known species numbered 48–51 are not included in the above key.

Natural arrangement and description of species

(i) sect. **Clemensia** (Merr.) Airy Shaw

In Hook., *Ic. Pl.*, *sub* t. 3333 (1937); Jacobs in *Reinwardtia* **3** : 263 (1955). Type: *C. macranthus* (Merr.) Airy Shaw.

Clemensia Merr. (genus) in *Philip. J. Sci.* **3** : 143 (1908); Pilger & Krause in Engl., *Nat. Pflanzenfam. Erg.* **3** : 162 (1914); Harms in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, **19**b1 : 155 (1940). Type (obligate lectotype): *Clemensia macrantha* Merr., i.e. *Chisocheton macranthus* (Merr.) Airy Shaw.

§*Graciles* Harms (sect. 'Euchisocheton') in Engl. & Prantl, *Pflanzenfam.* III, **4** : 295 (1896) & ed. 2, **19**b1 : 153, inc. 'Penduliflori' & 'Principes' (1940).

Pachycaul trees and treelets to 28 m high, unbranched or sparsely branched. *Leaves* to 220 cm long, imparipinnate or pseudogemmulate. *Inflorescences* unbranched or sparsely branched, to 7 m long, ± flagelliform with arillate seeds or shorter with sarcotestal seeds; *calyx* ± pubescent, entire or obscurely 3–4-lobed or splitting irregularly at anthesis; *petals* (4–)5–14, (16–)26–45 mm long, imbricate at apex; *staminal tube* glabrous or pubescent sparsely outside with band of hairs below lobes and/or within, up to the apical quarter, margin entire to lobed; *anthers* 3–30, hirsute or not, locellate or not; *disk* flattened or annular, sometimes lobed; *ovary* 4–6-locular; *stylehead* subdiscoid to capitate. *Fruit* tomentose with stinging hairs, to 13 cm diam., recurved; *seeds* arillate or sarcotestal, never scutellar.

1. Chisocheton macranthus (Merr.) Airy Shaw

In Hook., *Ic. Pl.* **34** : sub t. 3333 (1937); Jacobs in *Reinwardtia* **3** : 266 (1955); Meijer in *Bot. News Bull. Sabah* **8** : 78 (1967). Plate 1.

Clemensia macrantha Merr. in *Philip. J. Sci.* **3** : 144 (1908) & *Bibl. Enum. Born. Pl.* : 321 (1921) & *Enum. Philip. Fl. Pl.* **2** : 371 (1923) & in *Univ. Calif. Publ. Bot.* **15** : 122 (1929); Elmer, *Leafl. Philip. Bot.* **9** : 3349 (1937); Harms in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2, **19**b1 : 155 & t. 34 (1940); Heine in *Fedde, Repert.* **54** : 230 (1951). Types: Philippines, Mindanao, Lake Lanao, Camp Keithley, Sept.-Oct. 1906*, *Clemens 725* (?PNH†), also Jan., Feb., March, April, June & Sept. 1907, *Clemens s. n.* (?PNH†); Clemens specimens at Geneva, coll. March & Sept. 1907 and without date (G!), are probably isosyntypes.

[*Dysoxylum dehiscens* Elmer, *l.c.* (1937), *nom. in synon.*]

Chisocheton medusae sensu Heine in *Mitt. Bot. Staats. Münch.* **6** : 233 (1953), *non* Airy Shaw.

*Dates are recorded only for types, first records and material of new species or without collector's number.

Plate 1 *Chisocheton macranthus*. One infructescence and one leaf held by author. Malaysia, Sabah, Sandakan, Sekong Kechil, 24 May 1974, *Mabberley* 1718.

Pachycaul tree to 13 m with fastigiate branching and often several trunks from base, buttressed; d.b.h. to 22 cm. *Twigs* very stout, with large scutellar cicatrices, blackish. *Leaves* crowded in dense terminal spirals, to 220 cm long, pseudogemmulate; *petiole* and *rachis* stout, woody, dark-coloured, glabrescent to sparsely hairy; *leaflets* in up to 16 pairs, sometimes ± alternate at base of rachis, petiolules to 8 mm long, lamina oblong lanceolate, or ovate if small, 20–45(–55) cm long, (5–)8–12(–15) cm broad, weakly bullate, glabrous above, ± puberulous below, apex acute to acuminate, base obtuse to subacute, costae *c.* 15–24 on each side, tertiary venation scalariform. *Inflorescence* pendent, to 220 cm long; *axis* terete to weakly angular, weakly branched; *branches* crowded towards apex, with up to 12 flowers, bristly; *pedicels* in axils of fugacious pubescent bracts *c.* 6 mm long, *c.* 10 mm long, articulated with elongated base of calyx (pseudopedicel); *calyx* cupulate to cylindrical, 14–20 mm long and wide, pubescent, red-brown, apex ± truncate to irregularly 3–4-lobed; petals 6–10, 30–45 mm long, 4–7(–12) mm wide, creamy-pink; *staminal tube* 25–40 mm tall, 6–7 mm wide with entire to lobed lobes 4–6 mm long, creamy-white, glabrous outside except on the lobes, pilose within at base; *anthers* 16–30, *c.* 5 mm long, rather recurved, with pubescent connective; *disk* flattened, to weakly annular, glabrous; *ovary* in female flowers *c.* 5 mm diam., 5–6-locular, bristly; *style* bristly in lower half or glabrous, stylehead capitate, *c.* 2 mm diam. *Infructescence* from axils of last flush of leaves; *axis* to 3 m long with terminal bunches of up to 60 fruits, recurved, rostrate when immature, bright vermilion tomentose with irritant deciduous hairs, to 12 cm diam., dehiscent; *seeds* 2·5–3·3 cm long, triangular in cross-section arillate, aril reddish, covering inner edges of black testa.

Restricted to lowland rain forest of northern Borneo and the southern Philippines.

PHILIPPINES. Mindanao, Lake Lanao, Camp Keithley, March 1907, *Clemens s.n.* (G!)*; Surigao, *Ramos et al.* B. Sci. 34954 (K!) MALAYSIA. Sabah, Mt Kinabalu, Minitindok Gorge, *Clemens* 10431 (BM!, K!) & Beaufort, *Mikil* SAN 28119 (SAN!) & Sandakan, Lamag, SAN 66051 (SAN!) & Sandakan, Sekong Kechil, *Mabberley* 1718 (FHO!, SAN!) & Tawau, 30 miles NNW, Tawau, *Wood* SAN A3694 (A!); Sarawak, Bintulu, *Ashton* S17706 (A!, FHO!, K!, L!, SAR!) & Baram, *Anderson* S31804 (K!, SAN!, SAR!). INDONESIA. West Borneo, G. Kenepai, 20 Dec. 1893–4 Jan. 1894, *Hallier* 1938 (K!, L!, first record) & East Borneo, W. Kutai, 150–200 m, *Endert* 2591 (L!).

2. Chisocheton medusae Airy Shaw

In Hook., *Ic. Pl.* **34** : t. 3333 (1937); Harms in Engl. & Prantl, *Nat. Pflanzenfam.* ed. 2, **19**b1 : 155 (1940); Jacobs in *Reinwardtia* **3** : 264 (1955); Meijer, *Bot. News Bull. Sabah* **8** : 78 (1967). Type: Malaysia, Sarawak, 4th Divn, Mt Dulit (Ulu Tinjar), nr Long Kapa, < 300 m, 19 Feb. 1932, *Richards* 2631 (K, holo!; SING!).

Megaphyllaea sp., Merr. in *Univ. Calif. Publ. Bot.* **15** : 123 (1929).

Chisocheton medusae f. *hiascens* Jacobs, *op. cit.* : 265 (1955). Type: Indonesia, E. Borneo, W. Kutai, Long Hut, 150 m, 10 Nov. 1925, *Endert* 4766 (BO, ?holo; K!, L!, SING!).

Pachycaul tree to 28 m, d.b.h. to 30 cm, sparsely branched, buttressed; *bark* black with fine striations; *inner bark* dark brown, heartwood yellowish. *Young twigs* stout, fulvous tomentose. *Leaves* to 2 m long, bunched in terminal spirals, pseudogemmulate (imparipinnate with up to 4 pairs leaflets when young); *petiole* terete or flattened adaxially, decurrent with twig and forming axillary cavity with it; *rachis* somewhat angular, fulvous tomentose as the petiole or somewhat glabrescent; *leaflets* in up to 14 pairs, green when young, opposite except for those near base of rachis, petiolules terete, 2–3 mm long, densely pubescent, lamina to 40 cm long and 11 cm wide, lanceolate to elliptic-lanceolate, adaxial side sparsely pubescent when young, later glabrous, abaxial surface ± densely fulvous pubescent, apex acute to acuminate with 2 cm long tip, base narrowed into petiole and blunt, midrib stout, densely fulvous tomentose beneath, costae 20–24 on each side, weakly arcuate near margin, subpubescent above, prominent and hairy below. *Inflorescence* to 30 cm long, axils of upper or undeveloped leaves, weakly branched to narrowly paniculiform at base; *axis* compressed to angular, shortly fulvous-tomentose when young,

*Only one specimen per degree square is cited in order to save space; other specimens examined are given in the list on p. 372. An exclamation mark (!) indicates that I have studied the specimen cited, whilst a dagger (†) indicates material destroyed. For herbarium abbreviations see Holmgren & Keuken (1974).

glabrescent later; *branches* rather more densely pubescent, few-flowered, with caducous bracts; *pedicels* 3–20 mm long, somewhat angular, light-brown hirtellous, articulated with pseudopedicel, swollen at junction; *calyx* shallowly cupular to subcylindrical (10–)13–20(–23) mm long, 15–20 mm wide, ± densely ferruginous-velutinous, apex truncate or irregularly split halfway into 2–3 ± triangular lobes; *petals* 9–14, white, 35–40 mm long, 2–6 mm wide; *staminal tube* 27–32 mm long, glabrous, truncate, thin below; *anthers* 15–20, just exceeding tube or not, 3–4 mm long, glabrous; *disk* glabrous; *ovary* in female flowers 3–5 mm wide, 7–8-locular, glabrous to densely yellowish hirsute; *style* ± as long as tube, ± pubescent, especially below, stylehead discoid to shallowly cylindrical, 2 mm diam., glabrous. *Infructescence* to *c.* 30 cm of several ± spherical, golden-brown densely hispid fruits, to 13 × 10 cm, ? dehiscent; *seeds* to 5 cm long, orange-segment shaped with dense vascularized sarcotesta.

Northern Borneo, 0–300 m in lowland rain forest and hill dipterocarp forests, including those on limestone (Kalimantan).

MALAYSIA. Sabah, Sandakan, Sepilok, *Mabberley* 1680 & 1682 (FHO!) & Beluran, 20 m, Sg. Sapi Camp, *Tinggan* SAN 37378 (SAN!) & Tawau, mile 28, Kawa road, *Sinanggul* SAN 40604 (SAN!) & *Elmer* 21541 (A!, G!, K!, L!, SING!, first record) & Lamag, SE. Lotung Lake, *Lantoh* SAN 83177 (FHO!); Sarawak, 3rd Divn, Anap. Bt. Mersing, *Chai* S 19233 (FHO!, SAR!) & 4th Divn, *Richards* 2631 (type). INDONESIA. E. Borneo, E. Kutai, G. Sekrat, S. of Sangkulirang, 200 m, *Kostermans* 5897 (A!, G!, K!, KEP!, L!, LAE!).

Jacobs's f. *hiascens* is linked to the typical plant by intermediates, such as S 21788 from Sarawak, which merely represent different conformations of the calyx after splitting at anthesis.

3. Chisocheton tomentosus (Roxb.) Mabberley, **comb. nov.**

Fig. 1 (2). *Melia tomentosa* Roxb., [*Hort. Beng.* : 90 (1814), *nom. nud.*; Roxb. ex A. Juss., *Mém. Mus. Hist. Nat.* **19** : 220 (1830 ?), *nom. nud.*; Roxb. ex G. Don f., *Gen. Syst.* **1** : 681 (1831), *nom. nud.*] *Flora Ind.*, ed. 2, **1** : 394 (1832); *Walp. Rep.* **1** : 427 (1842); Roem., *Hesper.* : 96 (1846); Hiern in Hook. f., *Fl. Br. Ind.* **1** : 543 (1875); C. DC. in DC., *Monog. Phan.* **1** : 458 (1878); Curtis in *J. Str. Br. Roy. As. Soc.* **25** : 21 (1894). Type: Drawing in Ic. Roxb. (K! (photo at FHO!)); BM!, lecto (selected here); CALC (reproduced in *Ic. Roxb. Drawings Ind. Pl.* 3 : 16 (1969)). *Non* Miq., *Fl. Ind. Bat.* **1** (2) : 532 (1859) = *?Melia azedarach* L., *nec* Kurz, *Rep. Fl. Andamans*, ed. **1** : iv (1870) = *Chukrasia tabularis* A. Juss.

[*Meliacea rugosa* Wall., Cat. 4891 (1831–2), 'Penang 1822' (K-W!); Hiern, *op, cit.* : 369 (1875).]

C. princeps Hemsley in Hook., *Ic. Pl.* **19** (2) : t. 1844 (1889); Curtis, *op. cit.* : 22 (1894); King in *J. As. Soc. Bengal* **64** (2) : 29 (1895); Ridley, *Fl. Malay Penins.* **1** : 388 (1922); Whitmore, *Trop. Rain For. Far East* : t. 2·7 (1975). Type: Malaysia, Penang Island, Waterfall Garden, *Curtis* 1519 (K, holo!; CALC!, SING!).

Azedarach tomentosa (Roxb.) Kuntze, *Rev. Gen* : 110 (1891).

C. rubiginosus King (1895); Ridley, *op. cit.* : 389 (1922); Burkill & Henderson in *Gdns' Bull. Str. Sett.* **3** : 357 (1925). Types: 'Perak: Scortechini, Wray, King's Collector' – at CALC is Perak, Dec. 1883, *King's Coll.* 5343 (CALC!, L!, SING!, syn); other *King's Coll.* specimens labelled in King's hand may be isosyntypes as March 1883, 3946 (G!, K!, LE!, SING!) and Nov. 1883, 5095 (BM!, E!, G!, K!, L!, LE!, SING!).

C. rugosus Pierre, *Fl. For. Cochinch.*, sub. t. 347 (1896). Type: Duplicate of *Wall., Cat.* 4891 (P, holo; BM!, K-W!, iso).

Pachycaul tree to 21 m, unbranched or sparsely and fastigiately branched, often from near the base, taprooted at least when young; trunk to 20 cm diam., sometimes slightly fluted below, knobbled, or with small stilt roots; *bark* blackish brown, smooth to weakly fissured, greyer and with conspicuous scutellar cicatrices to 5 cm long and wide above; *inner bark* deep orange-yellow to brownish; *sapwood* ivory to fawn; *pith* soft, wide and white. *Terminal shoot axes* to 2 cm diam., below terminal rosettes of leaves; all young parts brown tomentose with irritant hairs. *Leaves* to 2 m, maturing in flushes, pinkish-red when young, imparipinnate (especially in saplings) or pseudogemmulate, pseudogemmula sometimes falling without further development; *petiole* base woody, massive, swollen, terete; *rachis* often angled, brown tomentose; *leaflets* sessile to subsessile, patent, basal ones smallest, 3–37 cm long, 2–10 cm wide, narrowly elliptic to

oblong, rugose, shiny and glabrous adaxially except for brown-tomentose midrib, tomentose or tawny pubescent abaxially, surface strongly reticulate-areolate, costae 12–30 on each side, arcuate. *Inflorescence* borne in upper axils, appearing when fruit maturing in old infructescences (female trees); *axis* massive, tough, to 90 cm long with flowers forming a terminal head to 45 cm long and 10 cm diam., sometimes with short branches to 7 cm, composed of fascicles of sweetly-scented pedicellate flowers, brownish-pink in bud; *calyx* (3–)4–8 mm tall and wide, cupular, reddish-brown, minutely puberulous, often warty, margin entire or obscurely 3–4-lobed, ± setose; *petals* 5–6(–10), 26–37 mm long, creamy red-striped outside, white flushed pink within, waxy, concave distally, linear-spathulate, densely pilose outside; *staminal tube* cylindrical, slightly wider at lobed mouth, villous with downward-pointing hairs within lower three-quarters, sometimes sparsely hairy outside, especially just below lobes, lobes *c.* 10–15, often irregularly bifid, shorter than the anthers; *anthers* 7–13(–15), 4·5–5 mm long, basifixed, boat-shaped, locellate, glabrous; *disk* annular, to 1 mm high, apically pilose; *ovary* (4–)5(–6)-locular; *style* cylindrical, sparsely pubescent, stylehead spherical. *Infructescence* of subglobular fruits, (4–)5(–6)-locular to 7 cm diam., golden-brown velvety with irritant detachable hairs; *seeds* 3–5, to 4 cm long, with white sarcotesta.

Lowland and hill dipterocarp forest of the Malay Peninsula.

MALAYSIA. Penang, *Curtis* 1519 (type of *C. princeps*); Kelantan, SE., Ulu S. Aring nr K. Tanang, *Whitmore* FRI 4475 (K!, KEP!, SAR!, SING!) & N., Jeli F.R., *Chelliah* FRI 6526 (K!, KEP!) & S. Labir, *Whitmore* FRI 4352 (KEP!); Perak, Larut, 90–150 m, *King's Coll.* 5095 (BM!, E!, G!, K!, L!, LE!, SING!); Pahang, K. Lompat, Kerau Game Res., *Whitmore* FRI 3463 (A!, K!, KEP!, L!, SAN!, SING!); Selangor, Kepong, Bt Lagong F. R., 300 m, *Mabberley* (& *Loh*) 1542, 1556, 1557, 1561 (FHO!); Johore, Labis F. R., S. boundary, *Ng & Whitmore* FRI 1010 (K!, KEP!, L!, SING!) & 28 miles S. of Mersing, 4 miles from road, 30 m, *Pennington* 8027 (FHO!, KEP!, L!, SING!) & S. Kayu, Mawai–Jemaluang road, *Corner* SFN 29285 (K!, SING!).

Hiern thought that '*Meliacea rugosa*' was probably not even meliaceous, but Pierre rightly placed it in *Chisocheton*. The specimen is a typical fruiting example from Penang, probably collected by George Porter in 1822. King thought *Melia tomentosa* possibly identical to his *C. rubiginosus*, though he pointed out the differences as he saw them, as chiefly in the number of petals; how he did not see that the CALC drawing of *M. tomentosa* was identical to the type of *C. princeps* is difficult to explain. His own *C. rubiginosus* has a rather high number of petals, but is linked by intermediates to typical *C. princeps* in this respect, and differs in no other characteristic.

4. Chisocheton polyandrus Merr.

In *Philip. J. Sci.* **21** : 520 (1922). Types: Malaysia, Sabah, Sandakan, Labuk, 30 Sept. 1918, *Wood* 657 (PNH?†, syn; A!, K!) and Sandakan, Batu Lima, Sept.-Dec. 1920, *Ramos* 1217 (PNH?†, syn; A!). Plate 2 & Fig. 1 (1).

Pachycaul tree to 6 m, unbranched or very sparsely branched, occasionally with stilt roots. *Leaves* to 150 cm long, imparipinnate with up to 14 pairs leaflets or pseudogemmulate when pseudogemmula densely long-pubescent; *petiole* terete, woody; *rachis* terete; *leaflets* opposite, or subalternate at base, where they are often small, and even irregularly lobed, 11–43 cm long, 5–13 cm wide, oblong-lanceolate, rather acuminate, base asymmetrical, cuneate to subcordate, bullate at altitude, adaxial surface glabrous or the veins ± pubescent, shiny, abaxial surface appressed hirsute, more markedly at altitude, costae *c.* 15 on each side, often sunken above, petiolules to 2 mm. *Inflorescence* borne in upper axils, up to four at any time, to 2 m long, unbranched, or with a few squarrose branches to 13 cm long at apex, where flowers are crowded together, young parts ferruginous-pubescent; *calyx* cupular to subcylindrical, 5–8 mm long, 5–6 mm wide, densely ferruginous-pubescent, green to deep red, margin truncate; *petals* 5–6, 28–32 mm long, creamy white with conspicuous pink or red tinge, subspathulate, fleshy, externally densely pubescent; *staminal tube* cylindrical, white, subglabrous outside and within, apically and basally with conspicuous band of hairs within, margin with *c.* 12–14 linear lobes, *c.* 3 mm long; *anthers* 12–14, *c.* 4 mm long, locellate, scattered ferruginous-pubescent on connective; *disk* shallow (*c.* 1 mm high), thick, truncate, glabrous; *style* cylindrical, glabrous, stylehead subcapitate, *c.* 1 mm diam; *ovary* ?3–5-celled. *Infructescence* pendent, to 2 m long with fruit aggregated at apex (Plate 2),

Plate 2 *Chisocheton polyandrus* fruits dehiscing; Malaysia, Sabah, Sandakan, Ulu Dusun, 16 May 1974, *Mabberley* 1688.

each ± spherical, covered with reddish irritant hairs, splitting into 3–4 valves; *seeds* 3, arillate, testa black, covered on inner surface with orange-red aril.

Lowland and hill dipterocarp forest of Brunei, northern Sarawak and Sabah, 150–300 m.

Malaysia. Sabah, *Wood* 657 (type, first record) & Sandakan, miles 81 W. of Sandakan, *Mabberley* 1708, 1709 (FHO!) & Ranau, Bt Kulong, 450 m, *Sadau* SAN 49763 (K!, SAN!) & Keringau, Kg Biah, *Mikil* SAN 42075 (K!, SAN!) & Kudat, Bengkoka F. R., 90 m, *Shea & Minjulu* SAN 76067 (FHO!, K!, SAN!) & Ulu Anak, Sg Kaindangan, *Aban & Saikeh* SAN 82406 (FHO!); Sarawak, 5th Divn, Ulu Lawas, 160 m, *Chai & Pa'ie* S 31533 (FHO!, K!, SAR!, SING!). Brunei. K. Sebatu, Batu Apoi, 15 m, *Ashton* BRUN 349 (L!, SAR!).

There is considerable variation in stature, pubescence, flower-colour and the degree of bullation of the leaflets with altitude, such that the pachycaul treelet a few metres high in cocoa-shade (*Mabberley* 1688) at low altitude may seem very different from the tall pubescent tree of higher altitudes (*Mabberley* 1708, 1709) though linked by a complete series of intermediates.

5. Chisocheton penduliflorus Planchon ex Hiern

In Hook. f., *Fl. Br. India* **1** : 550 (1875); C. DC. in DC., *Monog. Phan.* **1** : 536 & t. 7 Fig. 4 (1878); Curtis in *J. As. Soc. Str. Br.* **25** : 22 (1894); King in *J. As. Soc. Bengal* **64** (2) : 38 (1895); Harms in Engl. & Prantl, *Pflanzenfam.* III, **4** : 292, t. 162 Fig. E-G (1896) and in ed. 2, **19b1** : 139, t. 30 Fig. E-G (1940); Ridley, *Fl. Malay Penins.* **1** : 388 (1922); Burkill & Henderson in *Gdns' Bull. Str. Sett.* **3** : 356 (1925); Briquet in *Mém. Inst. Nat. Genev.* **24** : 66 (1935). Types: Malaysia, Malacca, 10 Nov. 1867, *Maingay* (BM!, K!, '325', L!, syn) & Penang, 1822, *Porter* in E.I.C. (i.e. K-W) 1255 (BM!, CGE!, K!, K-W!, LE!, syn).

[*Melia penduliflora* Wall., *Cat. 1255* (1828), *nom. nud.*; Roem., *Hesperid.* : 96 (1846), *nom. nud.*]

C. kunstleri King, *op. cit.* : 27 (1895). Types: Malaysia, Perak, '*King's Collector* 4502 [CALC?, BM!, syn], 7783 [CALC?, syn], *Scortechini* [CALC?, syn].'

C. penduliflorus var. *kunstleri* (King) Ridley, *l.c.* (1922).

Pachycaul treelet or *tree* to 10 m and 10 cm diam.; *bark* blackish; *inner bark* pale fawn. *Leafy twigs* 6–7 m diam. ± densely to rusty tomentose, to 15 mm when in fruit. *Leaves* imparipinnate to pseudogemmulate, with up to 8 pairs leaflets; *petiole* to 22 cm long, ± channelled adaxially; *leaflets* (8–)17–27·5 cm long and (3–)8–11·5 cm wide, elliptic-ovate to elliptic-oblong, subcoriaceous, adaxial surface subglabrous except ± fulvescent-tomentose on veins, abaxial surface ± pubescent, particularly on veins, base rounded to subcordate, sometimes asymmetrical, apex ± gradually long-acuminate, costae 15–22 on each side, with prominent intercostals, prominent abaxially; *petiolules* to 1 mm. *Inflorescence* to 7 m long, supra-axillary, pendulous, unbranched, or with branches to 7 cm long, usually with flowers congested in subsessile cymes at distal end like a bell-rope; *axis* 3–5 mm diam., densely rusty tomentose, with linear, hirsute bracteoles; *calyx* 3–4 mm tall, cupular to shortly cylindrical, pubescent, margin obscurely lobed to entire; *petals* 4–5, 18–22 mm long, linear-spathulate, concave, thick, dull red, clavate in bud and narrower in male flowers, pubescent on outside, adnate to staminal tube below; *staminal tube* with 3–5 irregularly bifid lobes, pilose outside below lobes, long-pilose with downwardly directed hairs in lower half within; *anthers* 3–5, *c.* 3 mm long, locellate, glabrous, included or slightly exserted; *disk* obscure to cupular, fleshy, glabrous; *style* and *ovary* densely long-pilose in lower three-quarters, stylehead subdiscoid to capitate with ± pubescent annulus. *Infructescence* of *c.* 10–15 recurved dehiscent fruits, silky pubescent with (? irritant) hairs, rostrate when young, recurved, to 5 cm long, splitting into 3 valves; *seeds* 3, arillate, testa black, covered on inner surface by red-orange aril.

Lowland rain forest of Lower Thailand and Peninsular Malaysia, to 900 m.

Thailand. Chawang, *Mrs Collins s. n.* (K!) & Phatalung, Kao Soi Dao, *Kerr* 19217 (K!, L!, P!) & Bukit, Pattani, *Put* 3629 (K!, L!) & Trang, Khao Chong, *Phusomsaeng* 59 (L!). Malaysia. Penang, *Porter* (type, first record); Kelantan, NW. Gunong Rabong, 45 m, *Stone* 7488 (KLU!, L!); Trengganu, Ulu Trengganu, near K. Petang, 160 m, *Cockburn* FRI 8434 (K!, KEP!, L!); Perak, Ipoh, Kledang Saiong F.R., 90 m, *Pennington* 7827 (FHO!) & Taiping, Waterfall Gdn, *Ridley* '1910' (BM!); Pahang, Chini, *Bray* FRI 11654 (K!, KEP!); Malacca, *Maingay* '325' (type); Johore, S. Kayu, *Kiah* SFN 32400 (KEP!, SING!).

Although the flowers are remarkably constant throughout the range of this tree, few other features are as stable. In Thailand, specimens tend to have smaller pseudogemmulate leaves, but in Malaysia there is great variation in leaf-shape, forms with wide leaflets being similar to those of the type of *C. kunstleri*, narrow ones to those of the type of *C. penduliflorus*. On the other hand, specimens such as that of *Phusomsaeng & Pinnin* 324 (L!) from peninsular Thailand are like those of *C. kunstleri*; the inflorescence of that specimen is some 7 m long compared with the shorter ones found in the Malaysian specimens, in some of which they are very short indeed. I am not altogether satisfied that the forms with slender branches and small leaves found in Thailand are inseparable from the others, but there is not sufficient material available to decide this at present.

6. Chisocheton crustularii Mabberley, **sp. nov.**
(Fig. 3) A *C. setoso* Ridley corolla parva, lobis tubi staminalis et antheris pluribus, lobis disco recurvis differt.

Arbor ad 8 m altus. *Truncus* ad 8 cm diam., interdum anteribus humilibus rotundatis praeditus; *cortex* cinerascens, auguste fissurata. *Ramuli* foliati circa 1·5 cm diam. *Folia* ad 135 cm longa, imparipinnata, foliolis usque ad 10-jugis; *rhachis* teres, subglabra; *foliola* opposita, subsessilia vel breviter petiolulata ubi petiolulo usque ad 16 mm longo, tumido, lamina 1·8 cm × 1·0 cm ubi proxima et pseudostipulanea, usque ad 38·0 cm × 10·1 cm ubi distali, vel 45·5 cm × 13·5 cm ubi terminali, auguste elliptica vel oblonga, supra perviridi, glabra, infra strigis sparsis apprime in nervature praedita, apice acuminato, base breviter attenuata vel subtruncata, nervis secundariis usque ad 24 utrinque, suboppositis alternatives, infra prominentibus, nervatura tertiaria conspicua, aliquantum scalariformi. *Inflorescentia* (mascula solum cognita) 38(–150) cm longa, pendens, gracilis; *axis* 2·0–3·0 mm latus, sericeus, dimidio distali florigero. *Flores* fasciculati, pedicellati, pedicellis 2·0–4·5 mm longis, recurvatis, hispidis; *calyx* 3·0 mm longus, circa 5·5 mm latus, vadose cupulatus, margine integro, extus pubescens apprime distali; *corolla* alba, petalis 5, 16 mm × 4·5 mm, auguste oblongis, extus pilis adpressis praeditis, intus glabris; *tubus staminalis* 14·5 mm longus, apice cum 11 lobulis, circa 3·5 mm longis, irregulariter bifidis, praeditus, subglaber praeter annulum latum pilorum adpressorum apice extus; *antherae* 11, circa 2·0 mm longae, infra apicem tubi insertae, vix locellatae; *discus* circa 0·5 mm altus, apice lobato penitus, lobis recurvatis; *stylus* filiformis, pilis dimidio proximo, pulvinifacientibus basi, praeditus, stigma circa 1 mm lata, sphaerica. *Fructus* ignotus.

Typus: Malaysia, Sarawak, 4th Divn, Marudi Tinjar, Ulu Sg. Dapoi, 'Lowland', 2 April 1965, *Ilias Pa'ie* S 22921 (K!, holo; FHO!, SAR!).

Known only from two collections from Tinjar, and closely resembling *C. setosus* which grows in the same area. The species differs in several floral features including the disk, which so resembles a pastrycook's creation as to suggest the specific epithet.

Malaysia. Sarawak, 4th Divn, S 22921 (type) & Tinjar, Ulu Buroi, Sg. Telangau, 28 March 1965, *Murthy* S 23329 (FHO!, K!, L!, SAR!).

7. Chisocheton setosus Ridley
In *Bull. Misc. Inf. Kew* **1930** : 366 (1930); Airy Shaw in Hook., *Ic. Pl.* **34** : t. 3334 (1937); Meijer in *Bot. News Bull. Sabah* **8** : 78 (1967). Type: Brunei, Limbang, 'c.o.d.z.' [4 Aug. 1890 (Stapf, 1907)], *Kunoeang in Haviland* 598 (K, holo! (photo at FHO); BM! (?, no data); SAR!).

Pachycaul treelet to 5 m, d.b.h. *c.* 8 cm, ? unbranched; *bark* smooth; *inner bark* pale yellow; *Leafy twigs c.* 1 cm diam., densely ferruginous-setose. *Leaves* to 1 m long, imparipinnate with at least 6 pairs leaflets; *petiole* to 35 cm long, subterete, sometimes grooved adaxially, to 6 mm diam., ferruginous-setose, hairs 2–3 mm long, swollen at base with conspicuous hollow at angle with stem; *rachis* 1–2-sulcate, setose as petiole; *leaflets*: proximal ones elliptic-oblong, to 20 cm long and 8·5 cm wide, distal ones oblanceolate to oblong, to 36 cm long and 10 cm wide, base rounded to attenuate apex acuminate, point 10–20 mm long, ± densely ferruginous setose on both sides, setae tinkling when stroked (dry plant), pale when dry, costae 17–20 on each side, prominent abaxially, intercostals ± prominently scalariform, petiolule 5–6 mm long, densely tomentose, that

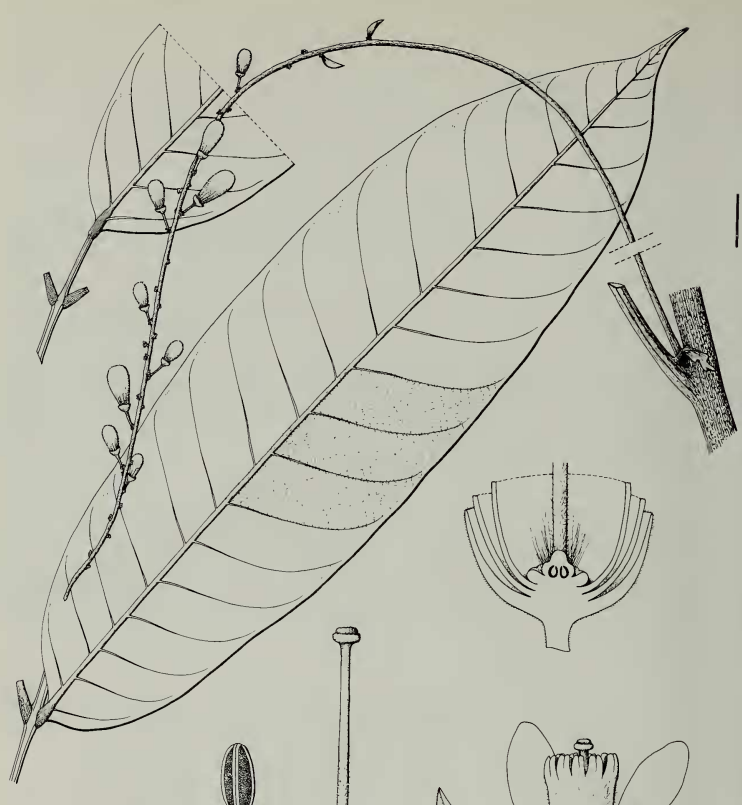

Fig. 3 *Chisocheton crustularii* Mabberley. Terminal leaflet, lateral leaflet and inflorescence from S22921, scale = 2 cm. Male flower (scale = 5 mm), half flower-base, pistil, part of tube (scale = 2·5 mm) and anther (scale = 1·25 mm) from S23329.

of terminal leaflet to 10 mm. *Inflorescence* to 2 m long, pendulous, ± densely setose, drying irregularly angled, with flowers, crowded in compressed cymes at distal end like a bell-rope, and linear setose bracts to 7 mm long; *flowers* recurved, shortly pedicellate; *calyx c.* 3 mm tall and 4 mm diam., cupular, margin entire to obscurely 3–4-lobed, setose to pubescent, reddish, somewhat elongated into a pseudopedicel below; *corolla* 3–3·5 cm long, *c.* 3 mm diam., weakly clavate, glabrous, white or with greenish tinge, petals 4–6, subspatulate, to 4 mm diam., imbricate at apices; *staminal tube* to 3·2 cm long, white, with 6–8 irregularly lobed or truncate lobes, glabrous except for band of hairs below lobes outside; *anthers* 6–8, *c.* 2 mm long, glabrous, scarcely locellate; *disk c.* 1 mm high, cupular, glabrous, obscurely lobed to entire; *ovary* in female flowers unknown; *style* sparsely pilose below, glabrous above, stylehead capitate distinctly narrow-annular above. *Unripe fruit* densely setose, pale yellow.

Rain forest of northern Borneo – Brunei, Sabah and Sarawak. Very rare and collected on only five occasions.

Malaysia. Sabah, Beaufort, Beaufort Hill P. F.R., 30 m, *Mikil* SAN 30162 (SAN!) & Sandakan, miles 16·5, Labuk road, 45 m, *Binson Sindin* SAN 62869 (K! (photo at FHO!)); Sarawak, 4th Divn, Mt Dulit, nr Long Kapa, *Local Coll. in Richards* 2539 (K!). Brunei. *Haviland* 598 (type, first record).

(ii) sect. **Chisocheton**

sect. *Euchisocheton* Harms in Engl. & Prantl, *Pflanzenfam.* III, **4** : 295 (1896), excl. *Pauciflori* et *Graciles.*

Trees and undergrowth treelets. *Indumentum* of simple hairs. *Leaves* pseudogemmulate, rarely imparipinnate (*C. lasiogynus*) or paripinnate (*C. patens, p.p.*). *Inflorescences* axillary, ramiflorous, cauliflorous or epiphyllous, or borne on supra-axillary branches. *Corolla* aestivation alternative, quincuncial or imbricate, white or cream to pink or red, petals 4–6. *Staminal tube* lobed or not. *Anthers* (3–)5–10(–18), locellate. *Disk* sometimes present. *Ovary* 2–8-merous. Stylehead capitate. *Fruit* unarmed. *Seeds* 3–6, arillate.

Allied to sect. *Clemensia* through the arillate species of the latter. Range of the genus except Australia and New Hebrides.

(*a*) ser. **Schumanniani** Harms ex Mabberley, **ser. nov.**

Harms in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, **19**b1 : 151 (1940), *sine descr. latin.*

A ser. *Paniculatis* Harms tubi staminalis margine integro.

Type: *C. schumannii* C. DC. = *C. lasiocarpus* (Miq.) Valeton, *s. lat.*

Ovary 3–8-locular. *Aril* covering only half of testa. *Inflorescences* axillary, supra-axillary or epiphyllous. *Leaves* pseudogemmulate.

Sumatra (?) and Sulawesi eastwards to Solomon Is.

8. Chisocheton schoddei P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 38 t. 5 (1975). Type: Papua New Guinea, Gulf District, junction Kapau & Tauri Rivers, *c.* 180 m, 2 March 1966, *Schodde & Craven* 4605 (LAE, holo!; A, K!).

Pachycaul tree to 12 m; d.b.h. 15 cm. *Bark* brown to greenish grey, rather smooth; *inner bark* creamy white to fawn. *Twigs* 7–8 mm diam., ± terete, pubescent when young, with leaves bunched in apical spirals. *Leaves* to 1·3 m long; *axis c.* 3·5 mm in diam., ± terete; *leaflets* 12–38(–50) cm long, 6·5–14·5(–20) cm wide, though most proximal ones may be much smaller, in up to 10 pairs, about 10 cm apart, with petiolules 5–8 mm long, ovate to oblong, sparsely pubescent adaxially, slightly more so below abaxially, venation prominent abaxially, acuminate, base ± subcordate, costae 8–14 on each side. *Inflorescence* from foliate axils, narrowly paniculate, to 1·2 m long; *axis* ± pubescent, unbranched or with distal branches to 5 cm long; *bracts* about 2 mm long, broadly ovate; *calyx* 5–6·5 mm tall, shallowly cupulate, pubescent outside, margin entire; *petals* (4–)5–6, to 17 mm long, 7 mm wide, alternative, quincuncial or imbricate, ligulate to elliptic, red outside, white to greenish within, ± pubescent except for top and bottom outside and just below anthers within; *anthers* 10–12, *c.* 3 mm long, locellate with ± pubescent connective; *ovary c.* 4 mm wide in female flowers, densely pubescent (4–)5–8-locular; style pubescent for most of its length,

occasionally glabrous at apex, stylehead *c.* 1·5 mm diam., capitate. *Infructescence* to 65 cm long; *rachis c.* 4 mm diam., with fruits crowded at apex, red, flattened globose, densely tomentose (4–)6(–8)-merous, with thick creamy pericarp; *seeds* up to 6, with black testa and peripheral orange-red aril covering adaxial half.

Rain forests of southern Papua, to 180 m.

Papua New Guinea. Gulf District, *Schodde & Craven* 4605 (type) & Vailala River, *c.* 3 km S. of junction with Lohiki River (LAE!); Central District, 5 km W. of Brown River Bridge, *Mabberley* 1773 (FHO!, K!, LAE!, UPNG!) & Brown River, *Millar & Gebo* 1154 (LAE!, UPNG!) & 1 mile N. of Brown River Bridge, 10 Nov. 1953, *Jackson & McDonald* NGF 4577 (K!, L!, LAE!, first record).

9. Chisocheton tenuis P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 46 t. 7 (1975). Type: Papua New Guinea, Eastern Highlands, Kassam Pass, 1280 m, 15 Jan. 1968, *Coode* NGF 32674 (LAE, holo!; A, BO, BRI, CANB, K, L!, SING).

[*C. pohlianus sensu* Harms in Engl., *Bot. Jahrb.* **72** : 187 (1942), *quoad spec. cit., non* Harms (1917).]

Understorey tree to 8 m, 7·5 cm d.b.h., branches ascending. *Bark* pale fawn; *inner bark* straw. *Twigs* to 4 mm diam. *Leaves* to 30 cm long with up to 7 pairs leaflets; *rachis* 2–3 mm diam., terete, with minute pseudogemmula and inflorescence scars; *leaflets* 7·5–25 cm long, 3·3–9·5 cm wide, obovate to elliptic, weakly acuminate, ± glabrescent except for hairier midrib, costae 6–12 on each side, petiolule (5–)10–23 mm long. *Inflorescence* epiphyllous, to 9 cm long, not or sparsely branched, usually arising near leaflet petiolules; bracteoles to 1·5 mm long; *pedicel* 2–12 mm long; *calyx* 3–4 mm long, cupulate to cylindrical with pseudopedicel *c.* 1 mm long, margin truncate, sometimes ± split at one point, pubescent; *petals* 4, 7·5 mm long, alternative, pinkish, externally ± densely adpressed pubescent; *staminal tube c.* 6·5 mm tall, pubescent within and outside except at top and bottom, margin ± entire; *anthers* 7–8, *c.* 2 mm long, locellate, inserted *c.* 3 mm within tube, connective pubescent; *disk* small; *ovary* pubescent (female flowers unknown); *style* with long ascending hairs except near apex, stylehead *c.* 0·5 mm diam. *Infructescence* of red fusiform fruits to 6 cm long and 2·3 cm diam., 3–4 locular, ± pubescent; *seeds* 3–4, *c.* 18 mm long, ± ellipsoid, with black testa and orange-red aril on inner surface.

Understorey tree in lower montane forest or (W. Sepik) in lowland rain forest to 1700 m in New Guinea.

Papua New Guinea. West Sepik, Ossima, 30 m, *Streimann & Kairo* NGF 39260 (L!, LAE!); Morobe, Sattelberg, 1360 m, *Clemens* 3825 (A!, first record) & Yunzaing, *Clemens* 3986 (A!) & Kulungtufu, 1675 m, *Clemens* 6588 (A!); Eastern Highlands, Kassam Pass, 1450 m, *Mabberley* 1765 (FHO!, LAE!).

10. Chisocheton cauliflorus Merr.

In *Philip. J. Sci.* **11** : 188 (1916, 'Chisochiton') & *Enum. Philip. Fl. Pl.* : 366 (1923). Type: Philippines, Samar, Catubig River, 1916, *Ramos* BS 24457 (PNH, holo?†; A!, BM!, L!).

Treelet to 3 m high, trunk to 4 cm diam., young parts ± fulvous-villous or hirsute. *Leafy* branches glabrous, though fulvescent when young, *c.* 5 mm diam. *Leaves* to 50 cm long with up to 6 pairs leaflets; *petiole* and *rachis* ± conspicuously fulvescent; *leaflets* 10–22 cm long, 4–7 cm wide, oblong or (proximal ones) elliptic and weakly lobed, acuminate, base ± rounded, costae 8–15 on each side, venation ± conspicuously fulvescent abaxially, prominent, petiolules 5–10 mm long. *Inflorescence* narrowly paniculate to 50 cm long, from tubercles on trunk or branches, or axillary; *rachis* 1·5 mm diam., ± prominently fulvous-villose with few few-flowered branchlets to 4 cm; *calyx* 4–5 mm long, cupular to cylindrical, ± densely adpressed fulvescent, margin truncate; *petals* 4, to 18 mm long, pinkish red, spatulate, alternative, ± subvillose outside; *staminal tube c.* 16 mm long, cylindrical, villous outside, glabrous within, margin truncate; *anthers* 8, *c.* 2 mm long, inserted *c.* 1·5 mm within tube, locellate, glabrous; *ovary* densely villous; *style* appressed pubescent except in upper third, stylehead subcapitate. Female flowers and fruits unknown.

Lowland rain forest of S.E. Philippines.

Philippines. Samar, March-April 1914, *Ramos* BS 17625 (K!, first record) & Catubig River, *Ramos* BS 24519 (K! – photo at FHO!); Mindanao, Surigao, Mt Kabatuan, 470 m, *Mendoza & Convocar* PNH 10495 (L! – photo at FHO!) & Agusan, Asiga River, *Ramos & Convocar* BS 83702 (A!).

The specimens from Mindanao are somewhat less pubescent than those from Samar. *C. warburgii* Harms (see below), described from one specimen (now ? destroyed) collected in Sulawesi, seems to resemble *C. cauliflorus* in several respects, *viz.* pubescence, leaflets, calyx and other details of the flowers, but differs in the extreme length of the axillary inflorescences 'longissimo fere metrali vel ultra (vel breviore?)', shorter petals (10 mm) and tube (6 mm).

11. Chisocheton novobritannicus P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 22, t. 3 (1975). Type: Papua New Guinea, New Britain, Kandrian subdist, nr Akinum, 150 m, 6 Oct. 1965, *Gillison* NGF 22445 (LAE!, holo; L! – photo at FHO!).

Tree to 13 m high, 20 cm d.b.h. *Leafy twigs c.* 6 mm diam., terete, long-villous when young. *Leaves* to 1·25 cm long with up to 11 pairs leaflets; *rachis* 5 mm in diam.; *leaflets* 13–37 cm long, 6·5–15 cm wide, ovate to oblong, adaxial surface subglabrous, or venation ± pubescent, abaxial surface glabrous except on fine venation, acute to acuminate, base rounded, sometimes asymmetrical, costae 10–17 on each side, petiolules to 12 mm. *Inflorescence* axillary, to 80 cm long, narrowly paniculate, twice branched with branches to 2 cm long, patent or reflexed with ± sessile flowers; *calyx* shallowly cupular, 1·5–2 mm deep, pubescent outside, with pseudopedicel 1 mm to margin entire; *petals* 4, *c.* 16 mm long, alternative, white, glabrous outside except sometimes pubescent at apex; *staminal tube c.* 14 mm long, glabrous or with spreading hairs near base within, margin ± entire to very shallowly lobed; *anthers* 8–9, 1·5–2·5 mm long locellate, glabrous; *disk c.* 0·5 mm high, glabrous; *ovary* small (female flowers unknown); *style* densely pubescent in lower half, stylehead *c.* 1 mm diam. *Infructescence* of ± globose fruits, *c.* 3·2 cm diam., 4-locular, sparsely pubescent; *seeds* ellipsoid, *c.* 20 mm long, with aril on inner surface.

Lowland rain forest of New Britain, to 150 m.

Papua New Guinea. New Britain, Cape Gloucester, north Aesiga village, *Frodin* NGF 26683 (LAE!) and Richthofen Bay, *Buderus* NGF 24041 (LAE!).

12. Chisocheton montanus P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 18 & t. 2 (1975). Type: Papua New Guinea, Eastern Highlands, Kassam Pass, 1450 m, 22 Jan. 1973, *Foreman & Stevens* LAE 58075 (LAE!, holo; A, BO, BRI, CANB, E!, K!, L!, NSW, SING!).

Understorey tree to 8 m; d.b.h. 24 cm. *Bark* dark brown, darker within, underbark reddish. *Twigs* to 3 mm diam. *Leaves* to 75 cm long; *petiole* and *rachis* to 2·5 cm diam., terete; *leaflets* in up to 13 pairs, petiolule to 6·5 mm long, pubescent, lamina 4·5–30 cm long, 2·7–9·0 cm wide, obovate or elliptic to oblong, the proximal ones often conspicuously smaller than the distal, fulvous-pubescent abaxially and on major venation adaxially, apex ± acuminate, base acute to cuneate, costae *c.* 7–15 on each side, venation weakly prominent abaxially. *Inflorescence* to 18 cm long, weakly scented, paniculate, arising from leafy axils though subtending leaf sometimes undeveloped, velutinous; *axis* unbranched (? female) or with branches to 2·5 cm long (male); *bracts* subulate to 3 mm long; *calyx* cupulate, 3–4 mm long, pubescent without, margin entire; *petals* (3–)4, *c.* 7 mm long, 2 mm wide, creamy yellow, pubescent without; *staminal tube* weakly adnate to corolla, *c.* 6 mm tall, margin ± entire, sericeous without though sometimes glabrous at base, glabrous within though sometimes with a few hairs at base; *anthers* (5–)6, *c.* 1·5 mm long, locellate, inserted *c.* 3 mm in tube, connective glabrous to sparsely hairy; *ovary* 4-locular; *style* to 6 mm long, glabrous or with hairs in lower half. Mature female flowers, fruits and seeds unknown.

Restricted to disturbed lower montane forest (1450–1850 m) in the highlands of eastern New Guinea.

Papua New Guinea. Eastern Highlands: Kassam Pass, 1450 m, *Mabberley* 1763 (FHO!) and 1766 (FHO!, K!) and ridge above Aiyura Agricultural Station, 1770 m, *Wheeler* ANU 5562 (L!, LAE!).

13. Chisocheton pohlianus Harms

In *Ber. Deut. Bot. Ges.* **35** : 341, abb. 1 (1917) & in Engl., *Bot. Jahrb.* **72** : 187 (1942, *excl. specim. cit.*) Hutchinson, *Phylogeny of Fl. Pl.* : t. 342 (1969); Stevens in *Contrib. Herb. Aust.* **11** : 28 (1975). Plate 3.

Plate 3 *Chisocheton pohlianus*. Epiphyllous inflorescence near apex of leaf; note pseudogemmula between most distal pair of leaflets (at bottom of plate). Papua New Guinea, Eastern Highlands.

Type: Papua New Guinea (East Sepik), Etappenberg, 850 m, Oct. 1912, *Ledermann* 9337 (B?†, holo). Plate 3.

Understorey tree to 8 m, sparsely branched; d.b.h. 7 cm. *Bark* greyish brown, scarcely cracking, cicatrose; *inner bark* claret. *Twigs* to 4 mm diam. *Leaves* to 2 m long; *petiole* and *rachis* to 3·5(–6·5) mm diam., terete with cicatrices of old inflorescences; *leaflets* in up to 28 pairs, petiolule to 6 mm long, lamina 5–14·5(–22) cm long, 3·2–5·5(–7) cm wide, ovate to lanceolate or elliptic, pubescent on veins adaxially and abaxially where sometimes over whole surface, apex acuminate, base cuneate, costae *c.* 14 on each side, venation weakly sunken adaxially, prominent abaxially. *Inflorescence* to 5 cm long, borne on currently flushing rachis, *Cymbopogon*-scented; *calyx* cupulate, to 3·5 mm long, margin ± entire, sericeous; *petals* (3–)4, to 10 mm long, 2 mm wide, creamy green, sparsely hairy outside; *staminal tube c.* 9 mm tall, margin obscurely lobed, subglabrous or with retrorse hairs within except at top and bottom; *anthers* (4–)6–7, locellate, inserted up to 3 mm within tube; *ovary* 3–4-locular; *style* to 8 mm long, glabrous or with ascending hairs throughout most of its length. *Fruits* subovoid to ellipsoid, to 4 cm long, 2·5 c m wide; *seeds* unknown.

Restricted to lower montane forest (600–1770 m) in the highlands of eastern New Guinea.

Papua New Guinea. East Sepik, Wewak-Angoram, *Pullen* 1531 (CANB, L!, LAE!); Western Highlands, Jimi Valley, NGF 38920 (K!, L!, LAE!); Eastern Highlands, 4 miles E. of Korn, NGF 10451 (K!, LAE!) & *Mabberley* 1772 (FHO!, LAE!).

14. Chisocheton lasiocarpus (Miq.) Valeton

In *Bull. Dept. Agr. Ind. Neerl.* **10** : 25 (1907); Steenis in *Blumea* **11** : 132 (1961); Stevens in *Contrib. Herb. Aust.* **11** : 15 (1975). Fig. 1 (4).

Dysoxylum lasiocarpum Miq. in *Ann. Mus. Bot. Lugd.-Bat.* **4** : 13 (1868); C. DC. in DC., *Monog. Phan.* **1** : 527 (1878) & in *Bull. Herb. Boiss.* II, **3** : 168 (1903). Type: Indonesia, Irian Jaya (Digul/Mimika/Fakfak), 1828, *Zippelius s. n.* (L!, holo).

Alliaria lasiocarpa (Miq.) Kuntze, *Rev. Gen.* **1** : 109 (1891).

Chisocheton sp. (Indonesia), Menninger, *Flow. Trees* : t. 228 (1962).

Tree to 33 m, d.b.h. to 60 cm; *trunk* fluted, with small buttresses to 1 m when mature. *Bark* blackish-brown to red, sometimes cracking vertically and flaking; *inner bark* ± red; *wood* pinkish straw to white. *Twigs* (2–)4–9 mm diam. cicatrose, sometimes myrmecophilous.* *Leaves* to 150 cm long; *rachis* 2–4·5 mm diam., terete to ± winged or rarely ± flattened; *leaflets* in up to 11 pairs, petiolules 3–8(–12) mm long, lamina (7–)14–45 cm long, (2·5–)7–23 cm wide, ovate to elliptic or suboblong, base occasionally subcordate, indumentum of adpressed hairs usually rather inconspicuous or puberulous on veins adaxially and/or velutinous abaxially, fine venation slightly raised, especially abaxially. *Inflorescences* axillary or on short shoots in defoliated axials of twigs to 2·5 cm diam., to 60 cm long but usually less, 0–2-branched, sweetly scented; *branches* to 20 cm long; pedicels 0–5 mm long; *pseudopedicel* to 1·5 mm long; *calyx* 2–4 mm tall, margin entire; petals (3–)4–5(–6), *c.* 7–16(–22) mm long, 0·7–4·5 mm wide, white or sometimes flushed pink, or claret, aestivation quincuncial, alternative or rarely imbricate; *staminal tube* a little shorter than petals, to 3 mm wide, pinkish, apex ± entire to shallowly lobed, outside glabrous to sparsely hairy in distal half, with retrorse hairs within from (usually) just below the anthers to the base, very rarely glabrous; *anthers* (3–)5–10(–18), *c.* 1·0–3·0 mm long, locellate, inserted about 2–4 mm within the tube; *ovary* (3–)4–5(–6)-locular; *style* 6–15 mm long, with hairs at least at base. Fruit to 4 cm diam., obovoid to ± spherical, brownish red, hairs dense, sometimes of conspicuously different lengths, pericarp fibrous; *seeds* up to 5, with black testa and red aril surrounding hilum, cotyledons superposed. 2n = 92.

Moluccas (Seram), New Guinea to Solomon Islands. 5–1525 m in primary or secondary forest, riparian or submontane, persisting in logged and grazed-through forest.

This species is broadly conceived (see p. 315). It may be useful for ecological and forestry purposes to recognize the major morphological entities, though there are many intermediates.

**Crematogaster, Iridomyrex, Campanotus* and *Tapinoma* spp. (Stevens, 1975 : 7).

The following key may be useful, though the very nature of this species denies the possibility of placing every specimen:

Key (after Stevens, 1975)

Leaf rachis prominently ridged or winged, adaxial surface flattened.
  Inflorescence 3·5–12 cm long, flattened, petals 14–22 mm long (e) **pachyrhachis**
  Inflorescence 8·0-*c.* 45 cm long, ± terete, petals 7·5–12 mm long (a) **novoguineensis**
Leaf rachis channelled to terete
  Inflorescence to 8(–12) cm long, flowers dense; buds *c.* 4 mm across; indumentum never of long, erect hairs
    Leaflets with dense ± crisped short hairs on midrib adaxially; anthers *c.* 3 mm long, style with hairs for most of its length (c) **lasiocarpus**
    Leaflets with, at most, adpressed hairs adaxially; anthers less than 2 mm long; style ± glabrous (d) **formicarum**
  Inflorescence usually more than 8 cm long; if less, flowers not dense, or buds *c.* 2 mm across or both
    Leaflets with erect or crisped hairs at least adaxially on midrib
      Leaflets without hairs abaxially; flowers always (?) 5-merous (g) **versteegii**
      Leaflets with erect hairs abaxially
        Leaflet base shallowly cordate (j) **schlechteri**
        Leaflet base rounded to acute (i) **trichocladus**
    Leaflets adaxially with adpressed hairs, often appearing glabrous
      Leaflets subcoriaceous; inflorescences less than 12 cm long, branches narrowly ascending, few-flowered (f) **caroli**
      Not this combination of characters
        No glabrous zone immediately below the anthers on inside of tube; flowers often 5-merous; calyx erect (h) **schumannii**
        Short glabrous zone immediately below anthers inside tube; flowers usually 4-merous; calyx usually ± spreading to suberect
          Style usually hairy for its entire length; fruit ovoid (a) **novoguineensis**
          Style glabrous at apex; fruits spherical (b) **weinlandii**

(*a*) **novoguineensis**

C. novoguineensis C. DC. in *Bull. Herb. Boiss.* II, **3** : 169 (1903, '*novoguineense*'); Baker f. in *J. Bot., Lond.* **61**, suppl. : 8 (1923); Stevens, *op. cit.* : 25 (1975). Type: Papua New Guinea, Central District, Sogere, *Forbes* (G!, holo '62').

C. forbesii C. DC., *op. cit.* : 168 (1903) & in *Nova Guinea* (Bot.) **8** : 424 (1910); Baker f., *l.c.* (1923). Type: Papua New Guinea, Central District, Sogere, *Forbes* 714 (G!, holo).

[*C. biroi sensu* C. T. White in *Proc. R. Soc. Qd* **34** : 38 (1922), *non* Harms (1905).]

Dasycoleum forbesii Baker f. & Norman in *J. Bot., Lond.* **61**, suppl. : 8 (1923). Types: Papua New Guinea, Central Dist., Mt Wori-Wori, 1500 m, *Forbes* 714 (BM!, G!, syn) & Sogere, 600 m, 21 March 1886, *Forbes* 834 (BM!, K!, syn).

C. myrmecophilus Merr. & Perry in *J. Arnold Arbor.* **21** : 313 (1940). Type: Papua New Guinea Central Dist., Mafulu, 1100 m, Sept.-Nov. 1933, *Brass* 5367 (A, holo; BM! BRI, K!, L!, US).

Central east New Guinea, hill or submontane rain forest (100–)600–1525 m.

Papua New Guinea. Morobe Dist., LAE 53857 (L!, LAE!); Central Dist., *Carr* 12156 (A, SING!).

(*b*) **weinlandii**

C. weinlandii Harms in K. Schum. & Lauterb., *Nachtr.* **3** : 283 (1905); Merr. & Perry in *J. Arnold Arbor.* **29** : 157 (1948); Hartley *et al.* in *Lloydia* **36** : 261 (1973); Stevens, *op. cit.* 50 (1975); Johns, *Comm. For. Trees Papua N. Guinea* **5** : 213, (1976). Type; Papua New Guinea, Morobe Dist., Finschhafen, Mar. 1890, *Weinland* 150 (B?†, holo; BRI, L!, SING!).

C. multijugis C. DC. in *Nova Guinea* (Bot.) **8** : 424 (1910). Types: Indonesia, Irian Jaya, (Digul/Mimika) Noord ('Lorentz') Rivier, 8 May 1907, *Versteeg* 1030 (L!, syn) & Sabangkamp, 3 May 1908, *Branderhorst* 315 (K!, L!, U!, syn).

C. multijugis var. *glabrior* C. DC., *l.c.* (1910). Type: Indonesia, Irian Jaya, (Digul/Mimika) Noord ('Lorentz') Rivier, 8 Oct. 1907, *Versteeg* 1903 (K!, L!, U!).

[*C. schumannii sensu* C. DC., *op. cit.* : 424 (1910, *quoad specim. cit.*), *non* C. DC. (1910).]

C. frutescens C. DC., *op. cit.* : 1013 (1914). Type: Indonesia, Irian Jaya, (Digul/Mimika) Noord ('Lorentz') Rivier, 13 Sept. 1909, *Römer* 6 (L!, iso).

C. sp. *aff. schumannii* C. DC.; White in *J. Arnold Arbor.* **10** : 228 (1929).

C. boridianus Harms in Engl., *Bot. Jahrb.* **72** : 180 (1942). Types: Papua New Guinea, Central Dist., Boridi, *c.* 1065 m, 21 Oct. 1935, *Carr* 14658 (B?†, syn; A, CANB, K!, L!) & 1280 m, 18 Nov. 1935, *Carr* 14997 (B?†, syn; BM!, CANB, K!, L!).

C. eurycalyx Harms, *op. cit.* : 182 (1942). Type: Indonesia, Irian Jaya, (Djajapura) Gebiet des Flusses Tor, 10 Oct. 1911, *Gjellerup* 732 (B?†, L!).

Eastern Moluccas, New Guinea and New Britain, in primary and secondary rain forest to 1280 m.

Indonesia. Seram, Central, Manoesela, *Kornassi* 578 (L!); Irian Jaya, Vogelkop, *Pleyte* 1113 (A, K!, L!, SING!) & Geelvink Bay, BW 1040 (A, LAE!) & Djajapura, BW 2747 (A, LAE!) & Mimika, BW 5155 (A, LAE!) & Digul/Mimika, *Branderhorst* 351 (K!, L!, U!). Cult. ex Irian Jaya, *Rastini* (K!, L!, SING!). Papua New Guinea. West Sepik, Varimo, *Streimann* LAE 52942 (A, K!, L!, LAE!); East Sepik, Ambunti, *Hoogland & Craven* 10118 (A, K!, L!, LAE!); Madang, Ramu valley, *Saunders* 401 (A, BM!, K!, LAE!); Morobe, Bulolo, *Mabberley* 1721, 1726, 1733 (all FHO!, LAE!) & Oomsis, *Henty* NGF 14358 (A, K!, L!, LAE!) & Huon Peninsula, *Hoogland* 8905 (A, K!, LAE!) & Markham River, *Hartley* 10954 (A, K!, LAE!); Western, Kiunga, Ok Tedi, *Henty et al.* NGF 42784 (A, K!, LAE!) & D'Albertis Junction, *Millar* NGF 35387 (K!, LAE!, SING!); Gulf, Purari Delta, *Schodde & Craven* 4448 (K!, LAE!); Central, Kairuku, *Darbyshire* 718 (A, K!, LAE!) & Karema, *Schodde* 2528 (A, K!, LAE!) & Cape Rodney, Pullen 8195 (A, K!, LAE), Milne Bay, Gumini River, *Brass* 23849 (A, K!, LAE!, US); New Britain, Rabaul, Powell Harbour, *Foreman* LAE 52156 (K!, LAE!) & Mussau Is., *Køie & Olsen* 1184 (FHO!).

This is a very widespread form, but tends to be difficult to separate from *novoguineensis*, on the one hand, and, on the other, *lasiocarpus*, e.g. *Kornassi* 578 above and *Teijsmann* 6058 (L!) and 6060 (K!, L!) and *formicarum*, e.g. *Pleyte* 1113 above in its western range, as well as *schumannii*, e.g. NGF 6427, 6566 & 7075 (all K!, New Britain) in the east and *trichocladus*, e.g. NGF 35387 above. Such a latter specimen has been named:

C. biroi Harms in K. Schum. & Lauterb., *Nachtr.* **3** : 283 (1905); Stevens, *op. cit.* : 53 (1975). Type: Papua New Guinea, Morobe, Sattelberg, 24 Nov. 1898, 'Oserdöben 20–25 m', *Biró* 18 (B?†, holo; BP!, iso).

(*c*) **lasiocarpus**

Western New Guinea rain-forest at low altitudes.

Indonesia. Irian Jaya, Vogelkop, *van Royen* 3439 (A, K!, LAE!) & Digul/Mimika/Fakfak, *Zippelius s. n.* (L!).

(*d*) **formicarum**

[*C. lamii* Diels ex Lam in *Nat. Tid. Ned. Ind.* **88** : 216 (1928); Perry in *Sargentia* **5** : 59 (1945), *nom. nud.*, *fide* Stevens, *op. cit.* : 52 (1975).]

C. formicarum Harms in Engl., *Bot. Jahrb.* **72** : 182 (1942); Stevens, *op. cit.* : 12 (1975). Types: Indonesia, Irian Jaya, (Djajapura) Mamberano River, Pionersbivak, 10–60 m, 2 July 1920, *Lam* 502 (B?†, syn; L!) & 6 July 1920, *Lam* 573 (B?†, syn; L!).

Lowland rain forest of north-west & central New Guinea.

Indonesia. Irian Jaya, Vogelkop, *van Royen & Sleumer* 7602 (K!) & Djajapura, *Lam* 502 (L!). Papua New Guinea. West Sepik, NGF 13269 (L!).

This entity is very similar indeed to some forms of *pachyrhachis* and is connected to *schumannii* by *Pullen* 1789 (LAE!) from West Sepik.

(*e*) **pachyrhachis**

C. pachyrhachis Harms in K. Schum. & Lauterb., *Fl. Schutzgeb.* : 382 (1901); C. DC. in *Bull. Herb. Boiss.* II, **3** : 169 (1903); Merr. & Perry in *J. Arnold Arbor.* **21** : 314 (1940); Harms in Engl., *Bot. Jahrb.* **72** : 187 (1942); Stevens. *op. cit.* : 27 (1975). Types: Papua New Guinea, *c.* 700 m (Madang), 22 June 1896, *Kersting* 2408, 2409 and Bismarcke-Gebirge (Madang), 7 June 1899, *Rodatz & Klink* 230 & Sattelberg (Morobe), 27 June 1890, *Lauterbach* 566 (all B?†, syn).

C. gjellerupii Harms, *op. cit.* : 183 (1942). Type: Indonesia, Irian Jaya, (Djajapura) Sawia, 100 m, 20 Aug. 1911, *Gjellerup* 596 (B?†, holo; L!).

New Guinea, primary rain forest to 1000 m.

Indonesia. Irian Jaya, Vogelkop, *Kostermans* 2650 (A, L!, SING!) & Djajapura, *Lam* 1201 (L!). Papua New Guinea. West Sepik, NGF 3697 (A, FHO!, K!, LAE!, SING!); East Sepik, *Hoogland & Craven* 19627 (K!, LAE!); Madang, NGF 28011 (LAE!); Morobe, *Clemens* 535 (L!).

(*f*) **caroli**

C. caroli Harms, *op. cit.* : 181 (1942); Stevens, *op. cit.* : 9 (1975). Type: Papua New Guinea, (East Sepik) Felsspitze, *c.* 1500 m, 24 Aug. 1913, *Ledermann* 13096 (B?†, holo; B!).

North-eastern New Guinea, primary rain forest to 1500 m.

Papua New Guinea. West Sepik, NGF 3928 (A, FHO!, K!, LAE!).

(*g*) **versteegii**

C. versteegii C. DC. in *Nova Guinea* (Bot.) **8** : 424 (1910); Stevens, *op. cit.* : 49 (1975). Type: Indonesia, Irian Jaya (Digul/Mimika), Noord ('Lorentz') Rivier, nr Geitenkamp, 12 Apr. 1907, *Versteeg* 1423 *p.p.* (K!, L!, iso).

Known only from the type.

(*h*) **schumannii**

Melioschinzia macrophylla K. Schum. in K. Schum. & Hollr., *Fl. Kais. Wilh. Land* : 62 1889); Warb. in Engl., *Bot. Jahrb.* **13** : 343 (1891). Type: Papua New Guinea, 'Augusta Station' (East Sepik), Sept. 1887, *Hollrung* 698 (K!, L!, LE!, iso).

C. macrophyllus (K. Schum.) Harms in Engl. & Prantl, *Nat. Pflanzenfam.* III, **4** : 295 (1896) & in K. Schum. & Lauterb., *Fl. Schutzgeb.* : 381 (1901), *non* King (1895).

C. schumannii C. DC., *op cit.* : 425 (1910), *excl. specim. cit.*; Harms in Engl., *Bot Jahrb.* **72** : 188 (1942); Stevens, *op. cit.* : 40 (1975); Johns, *Comm. For. Trees Papua New Guinea* **5** : 216 (1976). Type as above.

? *C. lauterbachii* Harms in K. Schum. & Lauterb., *Fl. Schutzgeb.* : 382 (1901); C. DC. in *Bull. Herb. Boiss.* II, **3** : 168 (1903). Type: Papua New Guinea, Upper Ramu Valley (Madang), 21 Oct. 1899, *Lauterbach* 3123 (B?†, holo).

? *C. lamekotensis* Harms in Diels, *Notizbl. Bot. Gard. Mus. Berl.* **10** : 276 (1928); Stevens, *op. cit.* : 53 (1975). Type: Papua New Guinea, New Ireland, Lamekot, Jan. 1926, *Peekel* 1022 (B?†, holo). *Fide* Stevens, *op. cit.* : 42 (1975).

Northern New Guinea and (?) New Ireland in lowland rain forest. It intergrades with *trichocladus* in the Solomons (see below) and is difficult to distinguish from *weinlandii* when in fruit.

Indonesia. Irian Jaya, Vogelkop, BW 7086 (SING!) & Djajapura, BW 2747 (K!, LAE!) & Fakfak, BW 12186 (A). Papua New Guinea. West Sepik, NGF 46710 (K!, LAE!); East Sepik, NGF 3848 (FHO!, K!, LAE!, SING!); Madang, *Mabberley* 1747 (FHO!, LAE!) & 1754 (FHO!, LAE!); Bougainville, *Kajewski* 1997 (BM!, G!). Solomon Islands. Choiseul, BSIP 17461 (K!, LAE!); New Georgia Group, BSIP 6016 (K!, LAE!, SING!) & 5878 (K!, LAE!, SING!, tending to *trichocladus*); Santa Isabel, BSIP 3650 (K!, SING!); Guadalcanal, BSIP 11289 (LAE!, SING!); Malaita, BSIP 3859 (K! LAE!, SING!); San Cristobal, RSS 6107 (K!, L!, LAE!, SING!).

(*i*) **trichocladus**

C. trichocladus Harms in Engl., *Bot. Jahrb.* **72** : 189 (1942); Stevens, *op. cit.* : 48 (1975). Type: Indonesia, Irian Jaya (Djajapura), Middle Tor River, 20 m, 10 Oct. 1911, *Gjellerup* 726 (B?†, holo; L!).

C. ledermannii Harms, *op. cit.* : 184 (1942); Stevens, *op. cit.* : 53 (1975). Type: Papua New Guinea, (East Sepik) Aprilflusse, 2–400 m, Nov. 1912, *Ledermann* 9661 (B?†, holo; B!).

Northern New Guinea to the Solomons in primary or secondary rain forest to 150 m.

Indonesia. Irian Jaya, Vogelkop, BW 6703 (L!, LAE!) & Djajapura, *Gjellerup* 726 (L!). Papua New Guinea. West Sepik, NGF 19515 (K!, LAE!, SING!, tending to *weinlandii*); Madang, *Mabberley* 1751 (FHO!, LAE!) & 1753 (FHO!, LAE!); New Britain, NGF 22409 (K!, LAE!, SING!); Bougainville, *Schodde & Craven* 4112 (K!, L!, LAE!). Solomon Islands. Choiseul, BSIP 18902 (K!, LAE!).

N.B. This is linked to *schlechteri* by the type of *C. ledermannii* and NGF 45834 of Western District (L!; LAE!), as well as to *schumannii* and *weinlandii* by intermediate forms.

(*j*) **schlechteri**

C. schlechteri Harms, *op. cit.* : 188 (1942); Stevens, *op. cit.* : 37 (1975); Johns, *op. cit.* : 215 (1976). Type: Papua New Guinea (Morobe Dist.), Jaduna, April 1909, *Schlechter* 19238 (B?†, holo).

North-east New Guinea, primary rain forest.

Papua New Guinea. Morobe, LAE 52343 (LAE!).

Sayers NGF 21573 (BM!, L!) from Morobe District is a leptocaul treelet less than 3 m high. The flowers are close to those of the more glabrous forms of *Chisocheton weinlandii*, but the inflorescence is 3-branched, the major branches being up to 16 cm long. In some respects it approaches *C. oreophilus* Harms, *op. cit.* : 185 (1942) – types: Papua New Guinea, (East Sepik), Etappenberg, 850 m, 28 Oct. 1912, *Ledermann* 9536, 18 Oct. 1912, *Ledermann* 9370 and 14 Oct. 1912, *Ledermann* 9265 (all B?†) – which probably belongs in the *lasiocarpus* complex – in its small size, but that plant had a smaller calyx and may well have been a form of *C. sayeri*.

15. Chisocheton pilosus C. DC.

In *Nova Guinea* (Bot.) **8** : 423 (1910). Type: Indonesia, Irian Jaya (Digul/Mimika), Noord Rivier near Geitenkamp, 12 July 1907, *Versteeg* 1423 *pro parte* (L!, iso).

C. sayeri var. *pilosus* (C. DC.) P. F. Stevens in *Contrib. Herb. Aust.* **11** : 36 (1975).

Understorey tree to 2·5 m. *Leaves* at least 25 cm long; *rachis* terete; *leaflets* in up to at least 3 pairs, to 26 cm long and 8 cm broad, shortly petiolulate, petiolule to *c.* 5 mm long, lamina oblong-ovate, glabrous adaxially and pilose abaxially, apex (?) acuminate, base cuneate, costae *c.* 13 on each side of midrib. *Inflorescence* axillary to 12 cm long, weakly paniculate; *branches* to 3 cm long, pilose; *bracts* linear, pubescent; *pedicels* very short; *calyx* campanulate, pubescent, margin entire; *petals* 4, *c.* 11·5 mm long, *c.* 1·5 mm wide, puberulous without; *staminal tube* villous within, margin entire; *anthers* 6–8, *c.* 1·5 mm long, alocellate; *ovary* and female flowers unknown; *style c.* 0·25 mm across, pubescent below, stylehead shortly cylindrical. *Infructescence* unknown.

Known only from the type collection.

16. Chisocheton sayeri (C. DC.) P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 32 (1975), *excl.* var. *pilosus*.

Dasycoleum sayeri C. DC. in *Bull. Herb. Boiss.* II, **3** : 170 (1903). Type: Papua New Guinea (Central Dist., Papua), 'Mt Olom', i.e. Mt Obree, 1887, *Sayer* 44 (G!, holo).

[*C. erythrocarpus sensu* Lane-Poole, *Rep. For. Res. Papua New Guinea* : 100 (1925), *non* Hiern (1875).]

C. archboldianus Merr. & Perry in *J. Arn. Arb.* **21** : 312 (1940). Type: Papua New Guinea, Central Dist., Bella Vista, 1450 m, Nov. 1933, *Brass* 5477 (A, holo; BRI (phot. at SING!)).

C. erythranthus Merr. & Perry, *l.c.* (1940). Type: Papua New Guinea, Central Dist., Papua, Kubuna, 100 m, Nov. 1933, *Brass* 5561 (NY, holo; A, BRI, (phot. at SING!)).

[*C. pohlianus sensu* Merr. & Perry, *op. cit.* : 311 (1940), *non* Harms (1917).]

C. acariianthus Harms in Engl. *Bot. Jahrb.* **72** : 180 (1942, '*acariaeanthus*'). Types: Papua New Guinea, Central Dist., Papua, Boridi, *c.* 1350 m, 11 Oct. 1935, *Carr* 14517 (B?†; CANB, K!, L!, SING!, syn) & *c.* 1435 m, 28 Oct. 1935, *Carr* 14757 (B?†; A, CANB, L!, SING!, syn).

C. graciliflorus Harms, *op. cit.* : 183 (1942). Type: Papua New Guinea (Madang Dist.), Bismarck-Gebirges, 1300 m, Nov. 1908, *Schlechter* 18582 (B?†, holo; B!).

? *C. leptopetalus* Harms, *op. cit.* : 184 (1942). Type: Papua New Guinea (Morobe Dist.), 'von Quembung zu Sattelberg', 700–1000 m, 28 March 1936, *Clemens* 2195 (B?†, holo).

[*C. schumannii sensu* Hartley *et al.* in *Lloydia* **36** : 261 (1973), *non* C. DC. (1910).]

Tree or *treelet* to 15 m tall, d.b.h. to 30 cm. *Bark* smooth or shallowly fissured, grey-green; *inner bark* pale brown. *Twigs* to 3·5 mm across. Leaves to 25(–75) cm long; *petiole* and *rachis* to 3·5 mm across, terete; *leaflets* in up to 9(–12) pairs with petiolules to 8 mm long, lamina (5–)7·5–20(43) cm long, (2·5–) 3·5–6·5(–9) cm wide, ovate to narrowly elliptic or lanceolate, subglabrous to velutinous on main veins adaxially and over whole abaxial surface, *c.* 9 costae on each side. *Inflorescences* axillary, to 70 cm long, but usually much shorter, not or 1-branched (female) or 1–2-branched (male), sweetly scented; *branches* to 15 cm, patent or ascending, sometimes with congested flowers; *pedicels* to 2·5 mm long; *calyx* 1–1·5 mm tall, reddish brown, obscurely lobed;

petals (3–)4(–5), 8–10 mm long, 1–1·5 mm wide, alternative to imbricate, pale cream; *staminal tube* to 10 mm tall, margin entire, pubescent without, glabrous to densely hairy within from just below anthers almost to base, white; *anthers* 4–6(–7), 0·7–1·2(–1·5) mm long, locellate or not, glabrous; *ovary* 3–5-locular; *style* to 9·5 mm long, densely hairy in lower two-thirds. *Infructescence* of obovoid to ellipsoid fruits to 2·8 cm long, 2 cm wide, obscurely stipitate, golden brown when young, with fibrous pericarp bearing hairs of conspicuously different lengths: *seeds* 3 with circumhilar aril, cotyledons collateral or superposed.

Lowland or submontane forest of New Guinea to 1500(–1830) m.

Indonesia. Irian Jaya, Geelvink Bay, Boemi near Nabire, *Kanehira & Hatusima* 12179 (A!). Papua New Guinea. Madang, *Schlechter* 18582 (B!, iso of *C. graciliflorus*); Morobe, Lae, Bumbu, *Womersley* NGF 17609 (K!, LAE!, SING!) & Busu, *Hartley* 11081 (K!, LAE!); Central, Kairuku nr Maipu Airstrip, *Darbyshire* 968 (K!, LAE!, SING!) & Abau, Cape Rodney, *Mabberley* 1788 (FHO!); Milne Bay, *Henty* NGF 16936 (K!, LAE!) & *Streiman & Katik* NGF 34112 (K!, L!, LAE!); Palmer River ?), 100 m, *Brass* 7174 (A!); Normanby Is., Lebudwa River, *Brass* 25607 (A!, K!, LAE!).

17. Chisocheton aenigmaticus Mabberley, **sp. nov.**

(Fig. 4) A *C. celebico* Koorders calyce breviore, minus pubescente, corolla 5-mera, tubo densissime sericeo, antheris longioribus, brevibus piliis foliorum differt.

Arbor ad ... *Ramulus* floriferus circa 8–14 mm crassus, teres, lenticellatus. *Folium* pseudogemmulatum; *rhachis* usque ad 78 cm longa; *foliolis* usque ad 13-jugis, *petiolulus* 3·5 mm longus, *lamina* usque ad 24 × 5·5 cm, elliptico-oblonga, apice aliquantum acuminata, basi obtusa vel subcordata, supra pilis sparsis adpressis in nervatione, infra aliquantum numerosioribus praedita, nervis secundariis usque ad 14-jugis. *Inflorescentiae* ex axillis vel paulum supra axillas foliorum ortae, thyrsoideae, pyramidales, 3-ramosae; *axibus* usque ad 70 cm longis et 6 mm crassis; *ramulus* proximis usque ad 25 cm longis, ascendentibus. *Flores* unisexuales subsessiles; *calyx* 2–2·5 mm longus, circa 3 mm latus, cupulatus, margine integro vel vadose 4–5-lobato, extus pilis brevibus, intus glaber; *corolla* aestivatione quincunciale vel alternativa, *petalis* 5–10 mm × 1·5 mm, angustate spathulatis, plus minusve extus pilis adpressis praeditis, intus glabris; *tubus staminalis*, apice cum vadosis 5-lobulis vel integra, extus pilis longis adpressis praeditus, intus plus minusve villosus, *antheris* 5, circa 2·2 mm longis, infra apicem tubi insertis, locellatis, fere basifixis; *discus* nullus; *ovarium* ?; *stylus* pilis ascendentibus praeditus, *stigma* cylindrico-capitato. *Infructescentia* ignota.

Typus: Indonesia, Sumatra, Simalur Is., 1 Oct. 1918, *Achmad* 642 (L!, holo (photo at FHO!); K!).

Known only from Achmad's collections from Simalur Is. Ecology unknown. The specific epithet draws attention to the fact that this isolated tree seems to be allied to the predominantly Papuasian section in which I have placed it. A knowledge of the fruit may suggest that it is better incorporated elsewhere.

Indonesia. Sumatra, Simalur Is., 7 Dec. 1917, '1918', *Achmad* 117 (L!) & 1 Oct. 1918, *Achmad* 642 (type) & 21 Oct. 1918, *Achmad* 681 (A!, K!, L!).

18. Chisocheton celebicus Koord.

In *Meded. Lands Plant.* **19** : [385 (1895/6) &] 636 (1898, '*celebica*') & *Suppl. Fl. N.O. Celebes* **2** : t. 42 & **3** : 22 (1922). Type: 'Minahassa, 600 m' (Koorders, 1898); Indonesia, Sulawesi, Minahassa, 15 Jan. 1895, *Koorders* 17950β (BO?, lecto? (*cf.* Koorders, 1922); L! (photo at FHO!)).

[*C. glomeratus sensu* Koord. in *Meded. 's Lands Plant.* **19** : 385 (1895/6) & Koord. Schum., *Syst-Verz.* III, Abt. **1** : 63 (1914), *non* Hiern (1875).]

C. sp. A, Koord. Schum., *l.c.* (1914).

Tree form unknown. *Leafy twigs c.* 8 mm diam. *Leaves* to at least 30 cm long, pseudogemmulate; *leaflets* in up to at least 5 pairs, to 32 cm long and 14 cm wide, ovate to elliptic-oblong, fulvous-tomentose on venation adaxially and over whole abaxial surface, apex shortly and gradually acuminate, base rounded, costae in about 19 sub-opposite pairs, midrib sunken adaxially,

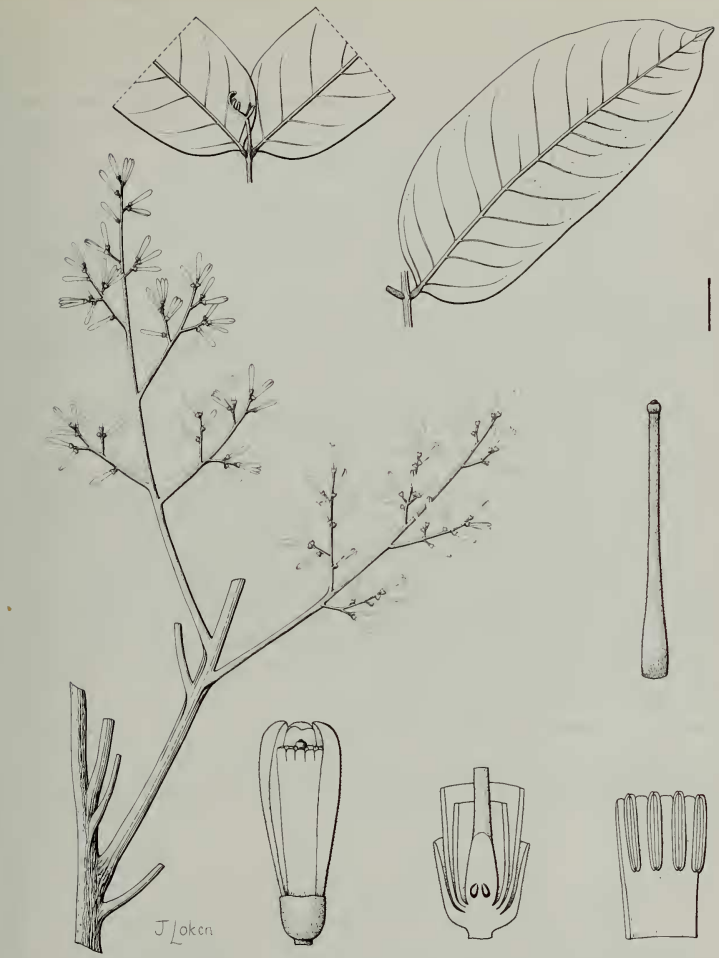

Fig. 4 *Chisocheton aenigmaticus* Mabberley. Leaf apex and lateral leaflet from *Achmad* 642 and inflorescence from Coll. 149 H. Bog. (scale = 2 cm). Flower (scale = 2·5 mm), half flower base, pistil and part tube (scale = 1·25 mm) from latter.

intercostal venation distinct; *petiolules to* 8 mm long; *pseudogemmula* densely long fulvous tomentose. *Inflorescence* supra-axillary, to 85 cm long; *axis c.* 3 mm diam., 2-branched; *branches* to 9 cm long, ± fulvous tomentose; *calyx* tubular, 2·5–3·5 mm long, 2–3 mm wide, long pubescent, margin truncate; *petals* 5, 12–14 mm long, 1·8 mm wide, alternative, narrowly spathulate, glabrous; *staminal tube* densely sericeous without, especially in more distal half up to the anthers, glabrous within or very sparsely villose, margin truncate: *anthers* 6, 1·2–1·5 mm long, narrowly oblong, locellate, glabrous, basifixed, inserted: *disk* conspicuous; *style* terete, long sericeous, style-head cylindrical-capitate. *Infructescence* unknown.

Known only from Koorders's collections from north-east Sulawesi, where it was found from 100 to 700 m.

Indonesia. Sulawesi, Minahassa, Menado, 500 m, *Koorders* 17948*β* (K!, L!) & Menado, 200 m, *Koorders* 17958*β* (K!) & 50 m, *Koorders* 17977*β* (L!) & 100 m, *Koorders* 17988*β** (L!) & 200 m, *Koorders* 17957*β* (K!) & 500 m, *Koorders* 17975*β* (L!) & 600 m, *Koorders* 17950*β** (L!) & 700 m, *Koorders* 19701*β* (L!) & 17965*β* (L!).

19. Chisocheton glirioides P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 13 & t. 1 (1975). Type: Papua New Guinea, Central Dist., Cape Rodney, near P.I.T. (Pacific Islands Trading, currently Australia New Guinea) Sawmill, 60 m, 18 June 1968, *Henty* NGF 38514 (LAE!, holo; A, BISH, BO, BRI, CANB, E!, K!, L!, NSW, PNH, SING! (photo at FHO!), US).

Tree to 21 m; d.b.h. to 25 cm; *outer bark* dark grey to grey-brown; *inner bark* dark straw. *Twigs* to 4·5 mm across. *Leaves* to 35 cm long, pseudogemmulate; *petiole* and *rachis* to 3·5 mm thick, terete; *petiolules* to 6·5(–12·5 mm long); *leaflets* 10–18(–24) cm long, 3·7–7 cm wide, ovate-elliptic, subglabrous with adpressed hairs on the venation, particularly adaxially, apex acute to weakly acuminate, base acute, costae up to 13 on each side of midrib. *Inflorescence* axillary, to 40 cm long, subglabrous, paniculate 1(–? 2) branched; branches to 4 cm long borne on proximal half of axis, patent; *bracts* narrowly triangular, to 1 mm long; *calyx* sessile, *c.* 2 mm long, cupulate, pubescent without, glabrous within, margin entire; *petals* 4, 12 mm long, 1·7 mm wide alternate to imbricate, pubescent without, glabrous within, red; *staminal* tube white, *c.* 11 mm tall, sparsely hairy in the middle on both sides, apex shallowly lobed to entire: *anthers* **6**–7, *c.* 1·3 mm long, locellate, inserted about 2·5 mm within tube; *ovary* 3–4-locular, *c.* 2 mm long (male flowers only known); *style c.* 9 mm long, pubescent, stylehead about 0·6 mm in diam. *Infructescence* of dehiscent spherical fruits *c.* 1·5 cm diam., shortly pubescent, with fibrous pericarp; *seeds* unknown.

Lowland rain forest to 240 m in southern Papua.

Papua New Guinea. Central Dist., Abau subdist., Mori River, *Henty & Lelean* NGF 41853 (A, LAE!).

20. Chisocheton sapindinus P. F. Stevens

In *Contrib. Herb. Aust.* **11** : 29 & t. 4 (1975). Type: Papua New Guinea, Morobe Dist., Oomsis, 270 m, 23 Oct. 1967, *Kairo & Streimann* NGF 30901 (LAE!, holo; A, BISH, BO, BRI, CANB, K, L!, NSW, PNH, SING, US).

Leptocaul, somewhat weeping, ± riparian *tree* to 10 m, d.b.h. to 10 cm; *outer bark* greyish, smooth or finely fissured, reddish within; *inner bark* straw sometimes unpleasantly scented. *Twigs* to 2 mm diam., weakly hairy when young, glabrous later, cicatrose. *Leaves* to 45 cm long with very small pseudogemmula; *petiole* and *rachis* 1–2 mm diam.; *petiolules* to 10 mm long; *leaflets* in up to 9 pairs, (4–)7·5–15·5 cm long, (2–)3·3–6·3 cm wide, lamina ovate to elliptic, glabrescent, apex acuminate, base cuneate to acute, ± asymmetrical, coriaceous, venation impressed adaxially when fresh, prominent on both sides when dry, costae 5–10 on each side. *Inflorescence* axillary, to 60 cm long but usually much less, 0–2-branched in males, unbranched in females; *branches* to 3 cm long, patent, with scattered flowers, especially distally; *bracts c.* 1 mm long, subulate; *pedicels* to 2 mm long; *calyx* 1·7–2·5 mm tall, often with a slit to 1 mm in margin; *petals* 4, *c.*

*Included in *Cedrela celebica* Koord. by Koord-Schum. (*loc. cit.*)

13·5 mm long, 1 mm wide, though smaller in males, alternative, ligulate, white or pinkish-green, glabrous or with a few hairs apically; *staminal tube c.* 13 mm tall, but smaller in males, glabrous, margin weakly lobed; *anthers* 4–6, *c.* 0·7 mm long, locellate, inserted *c.* 1·5 mm within tube, connective glabrous or weakly pubescent; *disk c.* 0·3 mm tall; *ovary c.* 0·7 mm tall (female), 3–4-locular, densely pubescent; *style c.* 8·5 mm tall, pubescent in lower half, stylehead *c.* 0·4 mm in diam. *Infructescence* of red, dehiscent, glabrous fruits to 6·5 mm long, 2·25 cm diam., with 3–4 valves, *seeds* 2–4, ellipsoid to boat-shaped, to 3 cm long, 1·8 cm wide and 1·1 cm thick, with orange-red circumhilar aril and superposed cotyledons.

Very local in primary rain forest to 760 m in eastern New Guinea.

PAPUA NEW GUINEA. Morobe Dist., Oomsis, 150 m, *Mabberley* 1745 (FHO!, K!) & 1746 (FHO!); Central Dist., Ower's Corner, *c.* 675 m, *Hartley* 10760 (A!, LAE!).

(*b*) ser. **Paniculati** Harms

In Engl. & Prantl, *Pflanzenfam.* III, **4** : 295 (1896) & *ibid.*, ed. 2, **19b1** : 151 (1940, 'emend.'). Type: '*C. paniculatus* Hiern', i.e. *C. cumingianus* subsp. *balansae* (Pierre) Mabberley, selected here.

§ *Tetrapetalum* Miq., *Ann. Mus. Bot. Lugd. Bat.* **4** : 26 (1868).

§ *Hexapetalum* Miq., *l.c.* (1868).

§ *Tetrapetali* Harms, *l.c.* (1940).

Leaves pseudogemmulate, or rarely imparipinnate or paripinnate. *Inflorescences* axillary, supra-axillary, cauliflorous, ramiflorous or borne on supra-axillary branches. *Seeds* arillate. *White latex* sometimes present in pith, pericarp, etc. of some species.

21. Chisocheton laosensis Pellegrin

In *Bull. Soc. Bot. Fr.* **91** : 178 (1945) & in Humbert, *Suppl. Fl. Gén. Indo-Chine* : 694 (1946). Type: 'Laos', '*Dusseaud*' (*Dussault*) 85 (P!, holo (photo at FHO!)).

Tree to 20 m, all young parts densely fulvous tomentose. *Leafy twigs* 6–9 mm diam. *Leaves* to 50 cm long, pseudogemmulate; *leaflets* in up to 8 pairs, to 22 cm long and 10 cm wide, elliptic, coriaceous, glabrous adaxially except (usually) on venation, ± tawny pubescent abaxially, apex obtuse and abruptly shortly acuminate, acumen 6–8 mm long, costae *c.* 13 on each side, arcuate, prominent adaxially, intercostal venation conspicuous; *petiolules c.* 1 cm long velutinous-fulvous. *Inflorescence* on supra-axillary branches to 90 cm long with reduced caducous leaves, the whole resembling a supra-axillary inflorescence, to 25 cm long, sparsely or unbranched with congested cymules of flowers; *bracts* lanceolate; *calyx* to 3 mm tall, cupular, pubescent without, glabrous within, ± 4-lobed; *petals* 4, 11–14 mm long, 2·5 mm wide, linear-oblong, alternative to imbricate, adpressed pubescent without, drying blackish, glabrous within; *staminal tube c.* 11–13 mm high, 7–8 crenulate or lobed, glabrous except for a few hairs in notches of lobes without and towards the base within; *anthers* 6–8, oblong-elliptic, locellate, glabrous, included; *disk* cylindrical, 1 mm tall, glabrous; *ovary* apparently 2-locular; *style* filiform, papillose, pubescent in lower half, stylehead subglobular, glabrous with an equatorial papillose band. *Infructescence* of obovoid dehiscent fruits with 3–4 valves to 3 cm long, 2·5 cm diam., rusty tomentose; *seeds* 1–2, apparently arillate, *c.* 15 mm long.

Rain forest to 600 m in Halmahera (& Seram ?), Moluccas.

INDONESIA. Moluccas, Halmahera, Goal Tugu aër, 125 m, *Pleyte* 230 (A!, K!, L!, SING!) & Gn Sembilan, 600 m, *Pleyte 360* (K!, L!, SING!) & W. Tobelo, *Beguin* 2302 (K!, L!) & Seram, East, Kiandarat ± 60 m, NIFS bb 25930 (L!, immature and possibly *C. lasiocarpus* '*trichocladus*'). 'Pl. du Laos. M. Dussaud [*sic*]. reçu 4 Octobre 1913, No 98' '85' (P!, type).

The type collection is clearly conspecific with the Moluccan gatherings. No other material from Indochina, nor indeed west of Halmahera, has been seen. I conclude that the tag '85', which, according to Dr H. Heine is the only label in Dussault's own hand, is extraneous. How such a transposition of a Moluccan plant to Dussault's collection of 106 specimens which were received from Hanoi (entry in acquisition list of the Laboratorie de Phanérogamie, P, according to Dr Heine) arose is difficult to understand, but may be attributable to a mix-up during the mounting

of the material. A similar explanation may account for *Solanum clerodendroides* Hutch. & Dalziel, a species described from 'west Africa' but which in reality came from Madagascar and is, in fact, a synonym of *S. madagascariensis* Dunal (see Heine, 1969). The choice of specific epithet for the *Chisocheton* was unfortunate!

22. Chisocheton ruber Ridley

In *Bull. Misc. Inf. Kew* **1930** : 365 (1930). Type: Malaysia, Sarawak, Padawan, 'Mt Braang', 240 m, 'b.u.d.l.' (4 Nov. 1889), *Haviland* 594 (K!, holo; SAR!, '$\frac{290}{594}$').

Tree to 15 m with fluted bole; d.b.h. to 20 cm. *Bark* smooth to weakly and irregularly flaky, greenish to creamy grey or reddish, with conspicuous inflorescence bosses, sometimes bearing short leafy shoots, arranged ± spirally from ground level to 5 m; *wood* ivory. *Leafy twigs c.* 12–15 mm diam. *Leaves* in terminal spirals, to 1·5 m long, pseudogemmulate, subglabrous; *rachis* ± 3-ribbed; *leaflets* up to 15 pairs, petiolules *c.* 6 mm long, lamina to 42 cm and 10 cm wide, oblong, coriaceous, brilliant carmine when young and appearing in flushes of up to 11 pairs at one time, very sparsely puberulous adaxially, apex acuminate, base asymmetric, subacute, costae about 12–14 on each side, tertiary venation conspicuous below. *Inflorescence* not or once-branched, sweetly scented, arising from bosses which produce inflorescences over several seasons, to 10 cm long; *rachis* pubescent; *pedicels* 1–3 mm long, pubescent, minutely bracteolate; *calyx* ± 4–5-lobed, *c.* 4 mm tall, cupular, rugose, pubescent, red; *petals* 5–6, 20–22 mm long, 4 mm wide at widest, 2·5 mm at narrowest, linear-oblong to spathulate, fleshy distally, pale red, pubescent without, imbricate to quincuncial; *staminal tube* ± adnate to corolla at base, pubescent distally without, villous within, white, 6–8 shallowly lobed, each lobe praemorse or irregularly 2–3-fid; *anthers* 8–10, 2 mm long, oblong, alocellate, yellow, basifixed, sparsely hairy near connective; *disk* obscure; *ovary* conical, appressed pubescent, 5-locular; *style* white, hairy in lower three-quarters or throughout, stylehead to 1·8 mm diam., very shortly cylindrical to subdiscoid. *Infructescence* to 12 cm long, weakly or not branched; *fruits* to 5 cm long, 3 cm diam., top-shaped, reddish, 5-merous with white latex in pericarp: *seeds* unknown.

Restricted to the limestone formations in Sarawak, 1st Divn, 80–250 m.

MALAYSIA. Sarawak, 1st Divn, Bau, *Anderson* in SAR 27889 (FHO!, K!, L!, SAN!, SAR!, SING!) & Padawan, Tiang Bekap, *Mabberley* 1635 (FHO!) & 1637 (FHO!).

23. Chisocheton sarawakanus (C. DC.) Harms

In Engl. & Prantl, *Pflanzenfam.* III, **4** : 296 (1896). Type: Malaysia, Sarawak, 1865–8, *Beccari* 3186 (K!, holo).

Dasycoleum sarawakanum C. DC. in DC., *Monog. Phan.* **1** : 541 (1878).

C. laxiflorus King in *J. As. Soc. Bengal* **64** (2) : 33 (1895) *p. maj. p.*; Ridley, *Fl. Malay Penin.* **1** : 390 (1922); Craib, *Fl. Siam. Enum.* **1** (2) : 253 (1926). Types: Malaysia, Perak, *Scortechini* '219' (CALC!, E!, K!, LE!) & 388 (CALC!), *King's Coll.* 1876 (CALC!), 4348 (CALC!, G!, L!), 5735 (CALC!, CGE!, E!, K!, SING!) & 7783 (BM!, CALC!, K!), [*King's Coll.* 5765 (CALC!, G!, K!, L!, LE!) cited by King is referrable to *C. patens* Bl.].

C. brachyanthus ['*brachyanthum*'] Merr. in *J. As. Soc. Str. Br.* **86** : 315 (1922) & in *Univ. Calif. Publ. Bot.* **15** : 122 (1929); Meijer, *Bot. News Bull. Sabah* **8** : 79 (1967). Type: Malaysia, Sabah, nr Sandakan, Sept.- Dec. 1920, *Ramos* 1252 (PNH?†, holo; A!, K!).

C. spec. A, Meijer, *l.c.* (1967).

[*C. glomeratus sensu* Meijer, *l.c.* (1967), *non* Hiern (1875), i.e. *C. patens*.]

Tree 5–20 m high, fluted below with small buttresses to 2 m tall; d.b.h. to 30 cm. *Bark* fawn to chocolate, smooth to weakly flaking; *inner bark* brownish yellow; *wood* white to pale fawn. *Innovations* ± pale ferruginous pubescent. *Twigs* terete, dark brown, glabrous when leafless, elenticellate, leafy twigs *c.* 5 mm in diam., rarely myrmecophilous. *Leaves* to 2 m long, pseudogemmulate; *rachis* pubescent to ultimately glabrous, brown; *leaflets* in up to 26 pairs, flushing in up to 3 pairs at once, 8–29 cm long, 4–8 cm wide, elliptic to elliptic-oblong, subcoriaceous, shiny and glabrous on both surfaces to ferruginous pubescent abaxially, particularly on veins, and on veins adaxially, apex rather abruptly caudate-acuminate with acumen to 2 cm, base slightly

narrowed or rounded, sometimes asymmetrical, costae 10–14 on each side, spreading, depressed adaxially and prominent abaxially when dried; *petiolule c.* 6 mm long, hairy. *Inflorescences* narrowly paniculate to subspiciform, to 50 cm long, supra-axillary, with few primary branches borne perpendicular to axis, with short few-flowered secondary branches, the sweetly scented flowers usually borne in pairs, sessile; *calyx* 2–3 mm tall, *c.* 1·8 mm diam., cupular, truncate to obscurely crenate, glabrous to puberulous outside, glabrous within; *petals* 4, *c.* 12 mm long, 1·8 mm wide, linear, obtuse, slightly concave at apex, white, drying black, puberulous outside, glabrous within; *staminal tube* slightly shorter than petals, cylindric, about 12 mm tall, 1·8–2·00 mm wide, somewhat appressed hirsute in distal part, crenate at apex; *anthers* (3–)4–5–6, 1–2 mm long inserted just below the rim and bearing posteriorly a few ciliate hairs; *disk* 0; *ovary* ovoid, appressed pubescent; *style* pubescent proximally, stylehead subcapitate, *c.* 0·5 mm diam. *Infructescence* with branches to 6 cm with up to 8 fruits on each; *young fruit* densely ferruginous pubescent, obovoid; *mature fruit c.* 4 cm diam., depressed globose, tapering into a short pseudostalk, crimson, pericarp sometimes with white sap; *seeds* 2 with shiny dark brown testa, partly covered in aril.

Malay Peninsula, Bangka and Borneo; 0–250 m.

INDONESIA. Bangka, Sg Lau, *Teijsmann* 386 (K!); Kalimantan, NE. of Bulungan, along Sebaku River, *Kostermans* 9318 (A!, K!, L!, SING!) & Nunukan, *Meijer* 2297 (A!, K!, L!, LAE!, SING!). MALAYSIA, Kedah, nr Kulim, Gg Bongsu F.R., *Pennington* 7835 (FHO!, KEP!, SING!); Kelantan, Ulu Lebir Res., *Suppiah* FRI 17742 (K!, KEP!); Perak, Larut, *King's Coll.* 6864 (K!); Selangor, Kuala Lumpur, Weld Hill, *Hanid* FD 1837 (KEP!, SING!); Johore, K. Tinggi to Mawai, *Corner* SFN 29311 (B!, K!, L!, LAE!, SING!); Sarawak, 1st Divn – Paku, *Haviland* 1601 (K!, SING!) & Matang, 'c.p.g.c.', *Haviland* (K!) & Lundu, Gg Gading, *Chai* S 18476 (A!, FHO!, K!, L!, SAN!, SAR!, SING!) & 3rd Divn – 2½ hr from Kapit, *Pennington* 8013 (FHO!, SAR!) & Baram, Gg Mulu, *Chew* 344 (SING!) & 5th Divn – Ulu Lawas, Kenayu F.R., *Chai & Ilias* S 31542 (FHO!, K!, SAR!, SING!); Sabah, Kota Kinabalu, Gaya Is., *Saikeh* SAN 67192 (K!, SAN!) & Sandakan - Sepilok, *Mabberley* 1646 (FHO!) & Sekong Kechil, *Mabberley* 1716 (FHO!) & Beaufort, Kg Banbangan, *Abau* SAN 66873 (FHO!, K!, L!, SAN!) & Semporna, Mt Pock F.R., *Nordin* SAN 54462 (SAN!) & Lamag, lake below Gg Lotung, *Cockburn* SAN 83010 (FHO!). SINGAPORE. Bt Timah, *Pennington* 8017 (FHO!, KEP!).

Chisocheton brachyanthus was described from a sparsely flowered specimen, which falls within the variable *C. sarawakanus*, the type of which lies within the range of form displayed by the syntypes of *C. laxiflorus*. There is a complete gradation between ± glabrous and hairy forms, such as *C. glomeratus sensu* Meijer in Sabah, as, for example, in Sepilok F.R. These hirsute forms may readily be distinguished from the pubescent forms of *C. patens* in the same area by their prominent leaf venation. However, elsewhere sterile material of these two species is often very difficult to separate.

24. Chisocheton lasiogynus Boerl. & Koord.

In Koord.-Schum. *Syst. Verz.* **2** : 26 (1910). Type: Indonesia, Sumatra, R. Kuantan, nr Mokko-Mokko [Mukomuko], 100 m, 19 Feb. 1891, *Koorders* 10380*β* (?BO).

Treelet to 2 m. *Leafy twigs* 4–5 mm diam. *Leaves* 50–68 cm, imparipinnate, 3–5-jugate, drying pale brown, subglabrous; *leaflets* opposite to subopposite, to 12 cm long and 5 cm wide, oblong to elliptic-ovate, sometimes subcrenulate, apex acuminate with acumen to 17 mm long, base cuneate, costae *c.* 9–10 on each side, venation impressed above, prominent below. *Inflorescence* to 24 cm long, unbranched, bracteate, flowers aggregated near apex; *calyx* 4·5–5·0 mm tall, 4·0–4·5 mm diam., cupular cylindrical, truncate to obscurely lobed, pubescent; *petals* 4–5, 17 mm long, *c.* 3 mm wide, glabrous to sparsely pubescent proximally outside, crimson; *staminal tube* 16 mm tall, slightly expanded at mouth, truncate to weakly crenulate, densely pubescent in distal half, white; *anthers* 5–8, 1·5–2·0 mm long, narrowly oblong to boat-shaped, basifixed, included (base *c.* 3 mm below rim of tube), scarcely locellate, glabrous; *ovary* conical, densely hairy, 3-loculate; *style* terete, sparsely pubescent in proximal half, stylehead subcylindrical, strongly exserted. *Infructescences* ramiflorous, sometimes apparently borne on reduced shoots, with fruits strongly rostrate when immature, crowded at apex; *seeds* unknown.

An apparently rare undergrowth treelet collected less than a dozen times in Sumatra and (?) western Java, but not in the latter since the 1880s.

Indonesia. Sumatra, Asahan, Aer Moette, 500 m, *Rahmat si Boeea* 9133 (A!, L!) & Lampung, NW. of Kotaagung, 350–450 m, *Jacobs* 8485 (K!, L!). Java, *Junghuhn* '216' (L!) & W. Java ('South-east'), *Forbes* 1383 (A!, BM!).

The specimens collected by Forbes and labelled Sumatra, *viz.* 1319 (CALC!), 1325, 1363 & 1399C (all BM!) do not correspond to the numbers listed in *Flora malesiana* 1, **8** : 34 (1974), where these numbers would appear to refer to Javanese collections. Clearly there is some confusion here, and it is possible that the Forbes's Java specimen and the Junghuhn collection were gathered in Sumatra. *Alston* 14553 (BM!) from Atjeh has rather larger flowers than usual and is more pubescent in all its parts.

25. Chisocheton amabilis (Miq.) C. DC.

In DC., *Monog. Phan.* **1** : 537 (1878); Merr. in *J. Str. Br. Asiat. Soc.* **spec. no.** : 319 (1921). Corner in *Gdns' Bull., Sing.*, suppl. 1 : 198 (1978).

Schizochiton amabile Miq., *Ann. Mus. Bot. Lugd. Bat.* **4** : 26, 27 (1868). Type: Indonesia, Kalimantan, R. Balito, 1836 ('Borneo'), *Korthals s. n.* (L!, U!) – 'along R. Doesoen' (*fide* Miq., *l.c.*).

S. amabile β *sumatranum* Miq., *op. cit.* : 28 (1868). Type: 'Sumatra', *Korthals s. n.* (L!).

C. illustris Ridley in *Bull. Misc. Inf. Kew* **1930** : 366 (1930). Type: Malaysia, Sarawak, 'nr Kuching', 27 Apr. 1893, *Haviland* 2854 (K!, holo; SAR!).

C. hackenbergii Harms in *Notizbl. Bot. Gart. Berlin* **15** : 476 (1941). Type: Indonesia, Kalimantan, 'Sampit, Urwald', 26 May and 7 July 1923, *Hackenberg* 1 & 1a (B?†).

[*C. brachyanthus sensu* Anderson in *Gard. Bull. Sing.* **20** : 115 (1963), *non* Merr.]

Tree 6–10 m high; *trunk* to 10 cm d.b.h. *Bark* smooth to finely cracked or pustulate, grey-green; *underbark* orange-red to pinkish; *inner bark* cream; *wood* white. *Leafy twigs* 3–7 mm diam.; elenticellate, reddish when dried. *Leaves* 20–95 cm long, pseudogemmulate; *rachis* terete or channelled laterally when dry; *pseudogemmula* fulvous-tomentose; *leaflets* in (4–)7–20 pairs, most proximal 2·2–11·5 cm long, 1·9–4·8 cm wide, regularly elliptic, most distal 7·5–25·5 cm long, 2·4–8·5 cm wide, more or less asymmetrical, elliptic oblong, coriaceous, shiny above, dull below, glabrous on both sides, or midrib brown-tomentose adaxially and/or venation pubescent abaxially, apex long cuspidate, base subequally acute or obtuse, costae 5–14 on each side, ascending, prominulous to prominent abaxially, petiolule 2–5 mm long. *Inflorescences* in axils of youngest leaves, thus occasionally appearing terminal, often supra-axillary, 8–45 cm long, pendent, fragrant; *rachis* glabrous to weakly pubescent, 3–5 mm diam., paniculate and 1–2-branched with pubescent pedicels articulated on slender branchlets *c.* 3–4 mm long arising from first-order branches to 9 cm long in male, unbranched, spiciform and minutely pedunculate with subsessile flowers condensed into short dense cymules mostly at distal end of rachis in females; *calyx* 3–4 mm long, cupular, 4–5-lobed, subglabrous to weakly pubescent, green; *petals* 5–6, 15–25 mm long, 2–3 mm wide, narrowly obovate, white or sometimes also tipped pink, sparsely hairy without or glabrous, drying reddish, alternate or quincuncial; *staminal tube* a little shorter than petals, subcylindrical, 5–7-lobed, subglabrous to villous without especially at base of lobes, villous within especially near base, lobes irregularly 2–3-fid or subentire; *anthers* 8–10, *c.* 1·5 mm long, scarcely locellate, long-pubescent dorsally, included within lobes; *disk c.* 0·5–1 mm high, subtubular, thick; *ovary* in female flowers conical, 4-loculate; *style* pubescent particularly in lower half, stylehead subcylindrical to spherical. *Infructescences* borne on foliate twigs to 8 mm diam.; *fruits c.* 4·0 cm diam., when dried, spherical, long stipitate with stipe 1·7–2·2 cm long, glabrous, pink ripening to bright rose-red, splitting into 3–4 locules, each with one seed, clustered at distal end of rachis in groups of 3–10; *seeds c.* 9 mm long, with chestnut brown testa and half covered in a basal yellow-orange aril.

Peat swamp forest and riparian forest (as at Sg. Sedili, Johore, where it is a common tree) from Sumatra and Malay Peninsula to Borneo, 0–20 m.

Indonesia. Sumatra, Palembang, ± 20 m, *Grashoff* 808 (L!); Kalimantan, *Korthals s. n.* (L!, U!, type). Malaysia. Selangor, Telok F.R., Klang, *Sinclair* SFN 40112 (SING!, ?label & locality confused, '4′ shrub') & Pahang, Kuantan mile 14, Pekan road, *Wyatt Smith* KEP 76583 (KEP!, SING!) & Johore, Sg. Sedili area, *Corner* SFN 21199 (KEP!, SING!); Sarawak, Kuching, *Haviland* 2854 (K!, SAR!, type of

C. illustris) & Rejang, 3rd Divn, *Anderson* 8087 (K!, KEP!, SAR!, SING!) & Baram, 4th Divn, *Anderson* S 2064 (SAR!, SING!). Brunei. Belait, Rasau, 5 m, *van Niel* 4335 (L!).

Chisocheton illustris was described from robust, somewhat pubescent, male material whereas *C. amabilis* was designated from a terminal bunch of undeveloped leaves and small inflorescences. All intermediate states are known from Johore material collected by Corner (SFN 21199 (KEP!, SING!), 21199A (SING!), 28568 (L!, LAE!, SING!), 28595 (K!, L!, LAE!, SING!), 28674 (K!, SING!), 28675 (A!, K!, L!, LAE!, SING!) & 32434 (K!, L!, SING!)). Although the type material of *C. hackenbergii* is apparently destroyed, there can be no doubt of its identity with *C. amabilis*. Harms's excellent description of the Sampit specimens exactly fits that of *C. amabilis* from the rest of Borneo, and is well matched by material collected from Sampit district by Kostermans (8026 (L!)), which, incidentally, bears inflorescences on reduced axillary branches as is found in *C. cumingianus*.

26. Chisocheton macrophyllus King

In *J. As. Soc. Bengal* **64** (2) : 32 (1895): Koord. & Valeton, *Bijdr. Java* : 106 (1896); Ridley in *J. R. As. Soc. Str. Br.* **33** : 59 (1900); Backer, *Schoolfl. Java* : 208 (1911); Koord., *Excl. Java* **2** : 443 (1912); Koord.-Schum., *Syst. Verz.* 1 Abt. **1** (140) : 27 (1912); Koord. & Val., *Atlas Baum. Java*, t. 166 (1913); Ridley, *Fl. Malay Penin.* **1** : 389 (1922); Backer & Bakh., *Fl. Java* **2** : 12 (1965). Types: Malaysia, Penang, 'Polo Boeting', 150 m, July 1890, *Curtis* 2469 (BM!, CALC!, K!, K [ex SING]!) & Perak, 'Selangor, near the Caves', Feb. 1890 *Curtis* 2327 (SING!) & Singapore, Pulau Ubin, 1893, *Ridley* 4767 (K!, SING!). *Non* (Koord.-Schum.) Harms (1896), i.e. *C. lasiocarpus* (Miq.) Valeton *schumannii*. Fig. 1 (3).

C. sp., Curtis in *J. R. As. Soc. Str. Br.* **25** : 22 (1894, '*Curtis* 2469').

C. kingii Harms in Engl. & Prantl, *Nat. Pflanzenfam.* III, **4** : 295 (1896), *nom. superfl.*

Tree to 35 m with irregular sparsely branched crown and buttresses to 3 m high and 2 m out, tap-rooted, at least when young; d.b.h. to 70 cm; *saplings* unbranched until *c.* 10 m high. *Bark* smooth to weakly cracking when exposing paler inner bark, with lenticels to 1 cm long, greenish brown; *inner bark* midbrown; *sapwood* pale fawn. *Twigs* stout with conspicuous cicatrices and white latex in pith and phloem. *Leaves* crowded in terminal spirals, to 240 cm, pseudogemmulate; *petiole* and *rachis* ± angled or grooved, subglabrous; *leaflets* in up to 28 pairs, to 39 cm long and 11 cm wide, oblong, pinkish when young, shortly acuminate, glossy dark green adaxially, paler abaxially, minutely pubescent on midrib, and also abaxially on veins (densely so in subsp. *fulvescens*), base rounded and asymmetrical, or, particularly in young plants, cuneate, costae 18–25 on each side, spreading, rather prominent adaxially in dried leaf, petiolules to 13 mm long. *Inflorescence* paniculate to 80 cm long, puberulous; branches rather distant, to 12 cm long, ultimate branchlets cymulose, many-flowered, smelling of prunes (Jacobs); *pedicels* pubescent; *calyx c.* 3–4 mm tall, cupular, pubescent, obscurely 4-lobed to entire; *petals* 4–5, to 15 mm long, linear, imbricate, spathulate and concave at apices (corolla clavate in male flowers), puberulous (to pubescent), glabrous within; *staminal tube* weakly adherent to corolla, hirsute along interlobe sutures near apex outside, villous within, mouth wider than tube with 6–8 linear 2–3-toothed lobes to 2·5 mm long; *anthers* 5–8(–9), *c.* 2·5 mm long, oblong, basifixed, locellate, sometimes slightly exserted; *disk* obscure; *ovary* 4-locular, sericeous; *style* sericeous in proximal $\frac{7}{8}$, stylehead cylindrical with apical lobing. *Infructescence* of globular, dehiscent pink-purple capsules to 8 cm diam., pericarp rather hard, laticiferous; *seeds* 4, with dark brown testa partly enclosed in an orange aril.

To 1100 m in lowland rain forest of western Malesia, the northern populations of the Malay Peninsula constituting the pubescent subsp. *fulvescens*.

(*a*) subsp. **macrophyllus**

Indonesia. Sumatra, '1881–2', ? Upper Musi Region, *Forbes* 2928 (A!); Anamba Is., Siantan, nr Terempak, *Henderson* SFN 20261 (K!, SING!); Java, Banten, Mt Hondje, 75 m, *Kostermans* 19369 (A!, K!) & Garut, 1360 m, FRI Ja. 4647 (L!) & Kediri, Wlingi, ± 200 m, *Koorders* 23020β (FHO!, L!) & Besuki, SE slope of Raung, 550 m, *Jacobs* 4860 (L!) & nr Puger, *Koorders* 5078β (L!); Kalimantan, W. of Samarinda, 60 m, *Kostermans* 6834 (A!). Malaysia. Kelantan, S. Betis nr S. Nenggiri, *Henderson* SFN 29718 (K!, L!, SING!); Perak, K. Kangsar, *Rahim* KEP 99818 (SING!); Pahang, 'Raub', FD 20410

(SING!); Selangor, Kepong, *Mabberley* 1546, 1547 & 1553 (all FHO!); Sabah, Ranau, *Pennington* 7934 (FHO!)? & Kinabatangan, Tedong, *Singh* SAN 31087 (K!)? Singapore. Pulau Ubin, *Ridley* 4767 (SING!).

(*b*) subsp. **fulvescens** Mabberley, **subsp. nov.**
A subsp. typico corollis et fructis et foliis fulvo-pubescentibus differt.

Typus: Malaysia, Kedah, Bt Perak F.R., south-facing slope, 450 m, disturbed forest, 27 Nov. 1969, *Everett* FRI 13699 (K!, holo; A!, KEP!, L!, SING!).

The geographically separated north-eastern populations in the Malay Peninsula are distinct in their heavy pubescence, but as there are a few intermediate specimens, subspecific rank for this taxon seems appropriate.

Thailand. Peninsular, Narathiwat, Bacho, *Phusomsaeng* 35 (K!, L!, P!) & Yala, Baw Hin, *Suvarnakoses* 1745 (L!). Malaysia. Kedah, Bt Perak F.R., 300 m, *Chan* FRI 13130 (K!, KEP!, L!, SING!) & 450 m, *Chan* FRI 13204 (K!, KEP!, L!) & Baling, Kroh–Baling road, *Yong* KEP 94679 (K!, KEP!) & Bt Enggang F.R., 120 m, *Chan* FRI 13242 (K!, KEP!, SING!); Kelantan, Ulu Sat F.R., *Kochummen* FRI 2946 (K!, KEP!) & Sg. Lebir, 2 miles S K. Sepia, *Cockburn* FRI 7053 (KEP!, L!, SAR!) & Ulu S. Aring nr K. Tapah, *Whitmore* FRI 4495 (K!, KEP!, L!, SING!); Perak, Grik State Land, *Rahim* KEP 95007 (A!, K!, KEP!, L!, SAN!, SING!) & Ulu Perak, K. Tianag, Jeram Benuas, 200 m, *Whitmore* FRI 15813 (KEP!) & Bintang Hijau F.R. 450 m, *Everett* FRI 14522 (A!, K!, KEP!); Pahang, Taman Negara, 150 m, *Whitmore* FRI 15319 (K!, KEP!) & 150 m, *Loh* FRI 17256 (K!, KEP!, SING!) & 200 m, *Kochummen* KEP 77763 (L!, SING!) & 300 m, *Shah & Shukor* MS 2635 (KEP!, SING!); Trengganu, Ulu Brang, 150 m, *Moysey & Kiah* SFN 33752 (SING!).

Intermediate specimens include: Malaysia. Selangor, Gombak, *Kochummen* FRI 2048 (A!, K!, KEP!, L!, SAN!, SING!); Pahang, 89 miles Benting River, 480 m, *Quaife* SFN 37393 (SING!) & Ulu S. Trengganu, between K. Biwa and K. Taat, *Cockburn* FRI 10644 (K!, KEP!).

27. Chisocheton dysoxylifolius (Kurz) Hiern
In *Hook. f., Fl. Br. India* **1** : 551 (1875); C. DC. in DC., *Monog. Phan.* **1** : 537 (1878); Prain, *Bengal Pl.* **1** : 315 (1903); Brandis, *Ind. Trees*: 139, 703 (1906). Type: Burma, Martaban, Thaungyin ['Thounggyeen'], March 1859, *Brandis* 720 (CALC; K!, photo at FHO!).
Schizochiton dysoxylifolium Kurz in *J. As. Soc. Bengal* **40** : 49 (1871) & **44** : 145 (1875) & *For. Fl. Br. Burma* **1** : 215 (1877). Type as above.

Tree to 28 m high; d.b.h. to 60 cm. *Leafy twigs* 5–8 mm diam., drying blackish. *Leaves* to 1 m long, pseudogemmulate, pseudogemmula pubescent; *leaflets* in up to 10 pairs, to 35 cm long and 11 cm wide, oblong to oblong-lanceolate, very sparsely hairy abaxially to entirely glabrous, apex acuminate, base somewhat asymmetric, cuneate, costae about 12–14 on each side, somewhat ascendant, tertiary venation prominent, petiolule to 8 mm long. *Inflorescence* supra-axillary, paniculate with ± squarrose branching to 2 orders, to 70 cm long; *branches* to 16 cm long (male) or with small subsessile glomerules of flowers, pubescent, bracteate; *bracts* fulvous pubescent, triangular, to 1 mm long; *calyx* 4 mm high, 3·5 mm diam., campanulate, pubescent; 4-toothed, teeth to *c.* 1 mm long; *petals* 4, *c.* 16 mm long, obovate linear, puberulous without; *staminal tube* adnate to corolla at base, appressed yellowish pubescent without, villous within, 6–7-lobed, lobes blunt or weakly toothed, glabrous; *anthers* 6–7, alternating with the lobes, *c.* 1·5 mm long, included, locellate, hairy on connective; *disk* obscure; *ovary* 4-merous, ± appressed pubescent; *style* ± pubescent in lower half. *Infructescence* of spherical to pyriform fruit to *c.* 7 cm diam., densely fulvous tomentose, shortly stipitate and weakly rostate; *rachis* to 5 m; *seeds* unknown.

Lower Burma and Thailand. Rarely collected. *Chisocheton dysoxylifolius* is closely allied to *C. macrophyllus*, but is readily distinguished from that species by its conspicuous bracts, and from the nearest populations of *C. macrophyllus*, i.e. subsp. *fulvescens*, by the subglabrous leaves.

Burma. *Brandis* 720 (type). Thailand. Southwestern, Kanchanaburi Dist., Lieuw Long Hill nr Khao Ngi Yai, E. of Sangkhla, *van Beusekom & Phengkhlai* 277 (E!, K! [photo at FHO!], L! [photo at FHO!], P!) & Peninsular, Trang, Khao Chong, 800–900 m, *Phusomsaeng* 170 (L! [photo at FHO!]).

28. Chisocheton cumingianus (C. DC.) Harms
In Engl. & Prantl, *Pflanzenfam.* III, **4** : 296 (1896).
Dasycoleum cumingianum C. DC. in DC., *Monog. Phan.* **1** : 541 (1878). Type: Philippines, Luzon, Albay Prov., 1841, *Cuming* 842 (A!, BM!, G!, K!, L!, LE).

Tree to 37 m tall; *bole* to 14 m d.b.h. to 150 cm; *buttresses* to 3 m tall and 2 m long, or bole fluted to 10 m. *Bark* scaly pale grey-brown; *inner bark* chestnut brown; *blaze* straw. *Cicatrices* conspicuous. *Leafy twigs* 5–7 mm diam., dark brownish black, smooth but conspicuously lenticellate, sometimes with white latex, rarely myrmecophilous. *Innovations* more or less rusty pubescent. Leaves crowded in dense terminal spirals, to 120 cm long, pseudogemmulate; *rachis* and *petiole* 2·5–5·0 mm thick, terete or weakly flattened adaxially; *leaflets* in up to 15 pairs, opposite or subopposite proximally, petiolules (4)–6–12 mm long, glabrescent to tawny tomentose, lamina (6–)10–42 cm long, (2·0–)5·0–14 cm wide, ovate to elliptic, apex shortly cuspidate, base unequally acute, pale abaxially, drying red-brown, papery to coriaceous, glabrescent or hispid pubescent on the costae adaxially or exceptionally softly velutinous (*Lister* 40 (L!)), costae 10–15 on each side, ascending, arcuate, more or less prominent below, fine venation prominulous. *Inflorescence* axillary, supra-axillary, or borne on short shoots (3–8 inflorescences per shoot) on defoliated twigs, branches or bole (Borneo), to 50 cm long, 2–3-branched; branches to 10 cm long, more or less pubescent; *pedicel* to 3·0(–4·0) mm long, with bracteoles 2 mm long, linear; *pseudopedicel* to 1 mm long; *calyx* 1·0–3·0 mm tall, campanulate, puberulous without, margin more or less entire; *petals* (3–)4(–5), 12–20(–25) mm long, 2·5 mm wide, spathulate, acute, pale yellow to white, reddish when dried; *staminal tube* to 18 mm tall, 1 mm wide, lobes, 6–9, entire or 2–3-fid, to 2·5 mm tall, ± glabrous without, ± pubescent within from just below anthers to base; *anthers* 6–9, 1·5–2·2 mm long, locellate, elliptic-oblong, glabrous to villose; *disk* annular, to 0·5 mm tall, glabrous; *ovary* in female (? and hermaphrodite) flowers 3–4-locular, each cell with 1–(2) ovules; *style* to 14 mm pubescent in proximal three-quarters, stylehead disciform to capitate. *Infructescence* a pendulous raceme to 30 cm long of globose to pyriform, glabrous to velutinous, occasionally weakly rostrate fruit to 6·0 × 7·0 cm, orange-red, stipe to 1·5 cm long, pericarp usually with white latex, dehiscent; *seeds* 3–4, reddish brown, arillate, aril orange-red, covering inner edges of blackish brown testa, crenate and sometimes with extension to hilum (see Roxb., *Ic.* 2229 (K!)), cotyledons superposed.

2n = 46, 92.

Used as a fish poison in New Guinea. The wood of Indian specimens has been tested against *chir*. Rain forest from Assam to New Ireland, to 1300 m. Three subspecies are recognized:

Inflorescences axillary to supra-axillary, paniculate — (*a*) subsp. **balansae** (mainland Asia)
Inflorescences borne on supra-axillary or ramiflorous short shoots, rarely supra-axillary and simple — (*b*) subsp. **cumingianus** (Philippines eastwards)
Inflorescences cauliflorous — (*c*) subsp. **kinabaluensis** (Borneo)

(*a*) subsp. **balansae** (C. DC.) Mabberley
In *Taxon* **26** : 528 (1977).
C. balansae C. DC. in *Bull. Herb. Boiss.* **2** : 578 (1894); Pellegrin in Lecomte, *Fl. Gén. Indo-Chine* **1** : 737 + t. 81, fig. 12–15 (1911); Lecomte, *Bois de l'Indoch.* : 134 (1925). Type: Vietnam, Tonkin, Mt Bari, Laubrok Forest, July 1887, *Balansa* 3693 (G!, holo; K!, P!).
[? *Guarea gobara* Buch.-Ham. in *Mem. Wern. Soc.* **6** : 306 (1832), *pro min. p.*; Wall Cat. 4885 *p.p.* (1831–2) *non Dysoxylum gobara* (Buch.-Ham.) Merr.]
G. paniculata Roxb., [*Hort. Beng.* [28] (1814); Juss., *Mém. Mus. Hist. Nat. Paris* **19** : 241 (? 1830), *nom. nud.*] *Fl. Ind.*, ed. 2, **1** : 242 (14 Jan. 1832), Wight, *Ic.* n. 146 (1839, 'Guaria'); Walp., *Rep.* **1** : 435 (1842); *non* Buch.-Ham., *l.c.* (1 Jan. 1832) *nec* Wall., *Cat.* 4882 (1831–2) = *Dysoxylum alliaria* (Buch.-Ham.) Balakr. Type: 'India Orientalis', 1811, *Roxburgh s.n.* (BM!, lecto, selected here).
Dysoxylum multijugum Arnott in Wight & Arnott, *Prodr.* : 121 (1834); Steud., *Nomencl.* ed. 2: 534 (1840); Voigt. *Hort. Sub. Calc.* : 135 (1845); Roemer, *Hesperid.* : 101 (1846); Drury, *Handb. Ind. Fl.* **1** : 168 (1864); *non C. multijugis* C. DC. (1910), i.e. *C. lasiocarpus s.l.* Type as for *G. paniculata* Roxb.
[*D. paniculatum* Arnott ex Wight, *Ic. sub* n. 146 (1839), *nom. in synon.*]
[*Cupania* sp. Wall., Cat. 4884B, i.e. 'Gentea [Jaintia] Hills', Assam, July 1830 (K-W!), (1847).]

Chisocheton paniculatus Hiern in Hook. f., *Fl. Br. Ind.* **1** : 552 (1875), *excl. syn. Sapindus multijugus* Wall. [= ? *Chukrasia*] *et Trichilia longissima* Wall. [= *C. patens* Blume]; C. DC. in DC., *Monog. Phan.* **1** : 531 (1878); Gamble, *Trees, Shrubs Bengal*, ed. 2 : 16 (1896); Prain, *Bengal Pl.* **1** : 315 (1903); Brandis, *Ind. Trees* : 139, 703 (1906); Pellegrin, *op. cit.* : 736 (1911) & supp. : 692 (1946); Cowan & Cowan, *Trees N. Bengal* : 32 (1929); Kanjilal *et al.*, *Fl. Assam.* **1** (2) : 234 (1936); Chun in *Sunyatsenia* **4** : 237 (1940); How & Chen in *Acta Phytotax. Sin.* **4** : 18 (1955). *Nom. superfl.*

Schizochiton paniculatum (Hiern) Kurz in *J. Asiat. Soc. Bengal* **44** : 145 (1875) & *For. Fl. Br. Burma* : 216 (1877).

C. coriaceus Pierre, *Fl. Cochinch.* t. 346A (1896); Pellegr., *op. cit.* : 737 (1911). Type: Vietnam, Saigon & Be Rivers, April 1866, *Pierre* 4302 (P!, holo; BM!, K!, L!, LE!).

C. thorelii Pierre, *op. cit.* : *sub* t. 346 (1896); Pellegrin, *op. cit.* : 740 (1911) & suppl. : 696 (1946). Type: Vietnam, Saigon River, *Pierre* 6318 (P ?).

C. cochinchinensis Pierre, *op. cit.* : t. 356B (1896); Pellegrin, *op. cit.* : 739 (1911). Type: Khmer Republic, Quan Phu Quoc Is., 18 Jan. 1874, *Pierre* 1397a ('1397') (P!, holo).

C. harmandianus Pierre, *op. cit.* : t. 347 (1896); Pellegrin, *op. cit.* : 740 (1911). Type: Laos, 'Bassin d'Attopeu', March 1877, *Harmand* 1228 (P!, holo).

C. chinensis Merr. in *Philipp. J. Sci.* **21** : 497 (1922). Type: China, Kwangtung, Tung Hsing, 24 June 1918, *Ts'oong* 1889 (PNH?† (photo at A!)).

C. siamensis Craib in *Bull. Misc. Inf. Kew* **1926** : 342 (1926) & *Fl. Siam. Enum.* **1** : 253 (1926); Pellegrin, *op. cit.*, suppl. : 692 (1946). Type: Thailand, Mae Hong Son, 500 m, 28 June 1922, *Kerr* 6171 (K! holo; SING!).

The mainland subspecies with axillary or supra-axillary inflorescences, and usually with rather pubescent leaves. 2n = 46. Assam to southern China and south-eastwards to Vietnam.

China. Kwangsi, Mekon, Seh-Feng Dar Shan S. Nanning, *Ching* 8484 (A!); Kwangtung, E. of Tung Hsing, *Liang* 69470 (A!); Valley of the Mali Kha, Hkamti Plain, 360–420 m, *Kingdon Ward* 12837 (BM!). India. Assam, Garo Hills, Tura, *Chand* 3061 (L!); Rajabhatkhawa, 60 m, *Bistras* (?) 1577 (A!); Khasia Hills, *Griffith* '1063' (A!, K!); Darjeeling, *Cowan s.n.* (E!, K!). Bangladesh (?). Bengal, Cox's Bazar, *Sinclair* 5741 (E!). Burma. S. Shan States, 600 m, Keng Tung, *Macgregor* 546 (E!); Hanthawaddi Dist., *Lace* 3059 (E!); Myitkyina, Nammu to Namna, *Lace s.n.* (E!); Myawadi to Kawhereik Hills, *Rock* 928 (US!). Laos. 'Bassin d'Attopeu', *Harmand* 1228 (P!). Khmer. Quan Phu Quoc Is., *Pierre* 1397a (P!). Vietnam. Annam, N. of Ninhhoa, *Poilane* 6374 (P!) & Quang Tri, *Poilane* 10829 (P!) & Da Nang ['Tourane'], 300 m, *Poilane* 7843 (P!); Tonkin, Phu-Tho, Cnan Mong, *Fleury* 30107 (P!) & Laocai to Cha Pa, *Petelot* 8663 (A!) & Si Hansi to Hoa Binh, *Petelot* 5833 (A!) & Tay-Ninh, *Thorel s.n.* (K!); Saigon & Be Rivers, *Pierre* 4302 (BM!, K!, L!, LE!, P!). Thailand. Mae Hong Son, 500 m, *Kerr* 6171 (K!, SING!); N., Chieng Mai, Doi Chiengdao, 100 m, *Bunchuai* 458 (FHO!) & 10 km W. of Fang, *Larsen et al.* 2623 (E!, K!, L!).

Chisocheton balansae was described from Vietnam and seems to differ from Roxburgh's '*C. paniculatus*' in its leathery leaflets, short unbranched inflorescence and pubescent anthers, but there are many intermediate specimens. The types of *C. cochinchinensis*, *C. coriaceus*, *C. harmandianus*, *C. siamensis* and *C. thorelii* (*e descr.*) fall within the range of variation of subsp. *balansae*. Specimens which have been referred to *C. siamensis* are said to differ in their larger leaflets and shorter pedicels, but plenty of intermediate specimens are known.

N.B. The type of *Epicharis juglans* Hance (BM!) includes a leaf of this plant.

(*b*) subsp. **cumingianus**

Dasycoleum cumingianum C. DC., *sensu str.*; Vidal, *Phan. Cuming. Philipp.* : 102 (1885) & *Rev. Pl. Vasc. Philipp.* : 84 (1886); F.-Vill., *Novis. App.* : 42 (1880).

C. cumingianus sensu str.; Merr. in *Philip. J. Sci.* **1**, suppl. : 72 (1906); West & Brown in *Bull. Philip. Dept Agr. For.* **20** : 117 & t. (1920) & **22** : 119 (1921); Merr., *Enum. Phil. Pl.* : 367 (1923); Briquet in *Mém. Inst. Nat. Genev.* **24** : 67 (1935); Elmer, *Leafl. Philip. Bot.* : 3346 (1937).

C. amboinensis Valeton in Hochr., *Pl. Bogor. Exsicc.* : 67 (1904); Briquet, *op. cit.* : 66 (1935). Type: Indonesia, Ambon, *Teijsmann s.n.* (K!).

[*C. benguetensis* Elmer, *Leafl. Philip. Bot.* **9** : 3343 (1937), *nom. non rite publ.* (*anglice*).]

[*Dysoxylum sorsogonense* Elmer, *op. cit.* : 3378 (1937), *nom. non rite publ.* (*anglice*).]

C. morobeanus Harms in Engl., *Bot. Jahrb.* **72** : 185 (1942); Stevens in *Contrib. Herb. Aust.* **11** : 21 (1975); Johns, *Comm. For. Trees Papua New Guinea* **5** : 214 (1976). Type: Papua New Guinea, Morobe Dist., Sattelberg, 1000 m, 23 Jan. 1936, *Clemens* 1687 (B?†, holo).

?*C. toricelliensis* Harms in *op. cit.* : 188 (1942); Stevens in *op. cit.* : 53 (1975). Type: Papua New Guinea, West Sepik, Torricelli Mts, April 1902, *Schlechter* 14402 (B†, holo).
[*C. cf. pachyrhachis sensu* Hartley *et al.* in *Lloydia* 36 : 261 (1973), *non* Harms (1901).]
C. sp., Lane-Poole, *Rep. For. Res. Terr. Papua New Guinea* : 100 (1925).

Throughout the range of this subspecies there is a distinct trend from axillary inflorescences in the north-west (Philippines) to reduced branches bearing inflorescences on defoliated twigs in the south-east. There are specimens which represent the exception throughout the range, however (see Stevens, 1975), and a similar variation is also to be noted in *C. cauliflorus* Merr. The leaves lack the conspicuous rusty pubescence characteristic of many of the mainland forms. 2n = 92.

Malesian Islands from Philippines and Sulawesi to New Ireland.

Philippines. Luzon, Tayabas, Lucbau, *Elmer* 9304 (A!, BM!, E!, G!, LE!); Albay, *Cuming* 842 (A!, BM!, G!, K!, LE!); Sorsogon, Mt Bulusan, *Elmer* 15451 (A!, BM!, G!, K!, U!); Laguna, Mt Maquiling, *Elmer* 18055 (A!, BM!, K!, U!); Catanduanes, *Ramos* BS 30340 (BM!, K!). Leyte, *Wenzel* 1289 (A!, BM!, G!). Mindanao, Benguet, Baguio, *Elmer* 8964 (A!, BM!, K!); San Ramon, Zamboanga, *Williams* 2442 (A!, K!). Basilan, *Vidal* 2329a (K!). Canarines, Saguay, *Ramos* BS22157 (BM!). Indonesia. Moluccas, Ambon (cult. Java), *Sutrisno* 13 (K!, L!); Ternate, Foramadiahi, 400 m, *Beguin* 1240 (L!); Buru, *de Vriese* 293 (L!). Sulawesi, Malili, 250 m, bb Cel/V-173 (L!). Irian Jaya, Serui, Eil. Japen Manialtu, ± 370 m bb 30364 (L!); Vogelkop, *Kostermans* 2827 (A, *fide* Stevens); Djajapura, Camp Albatross, *Docters van Leeuwen* 11268 (K!, L!, SING!). Papua New Guinea. East Sepik, NGF 3812 (LAE! SING!). Madang, Gogol Logging Area, *Mabberley* 1757 (FHO!, LAE!). Morobe, Bulolo, *Pennington* 8084 (FHO!) & Busu nr Lae, *Pennington* 8052 (FHO!) & Gurakor, *Mabberley* 1742 (FHO!, LAE!) & Sankwep, *Stevens & Katik* NGF 58003 (K!, L!, LAE!). Western Highlands, Hagen, *Millar* NGF 37713 (K!, L!, LAE!). Central, Abau, Mori River, *Henty & Lelean* NGF 41896 (K!, L!, LAE!). Northern, Popondetta Dist., *Cavenagh & Pryor* NGF 2056 (K!, L!, LAE!) & Kokoda, *Millar* NGF 23601 (K!, L!, LAE!, SING!). New Britain, Rabaul, Matanakunei, *Ridsdale & Katik* NGF 38001 (K!, LAE!); Kariura R., *Henty* NGF 29406 (K!, L!, LAE!, SING!); Keravat, *Pennington* 8109 (FHO!). New Ireland, NGF 46065 (A, K!, L!, LAE!).

The flowers of the type of *Chisocheton cumingianus* are somewhat larger and borne on somewhat stouter pedicels than, in general, those of the mainland subspecies although specimens approaching the type of subsp. *balansae* may have such flowers; alternatively there are specimens of subsp. *cumingianus* from the Philippines with slender flowers more typical of subsp. *balansae*, e.g. *Vidal* 2330 from Sorsogon. Stevens (1975) drew attention to the close similarity between *C. cumingianus*, *C. amboinensis*, *C. morobeanus* and *C. torricelliensis*. *C. morobeanus* and *C. amboinensis* typically have inflorescences borne on short shoots (see above), whereas this condition is found in trees with axillary inflorescences as well as in 'typical' *C. cumingianus*. Stevens thought that *C. torricelliensis* might be *C. morobeanus* but noted that it has an axillary inflorescence. A recent collection of the latter from Madang (*Mabberley & Katik* 1757) has axillary and ramiflorous inflorescences as do some Philippine specimens such as *Fénix* BS28223 (A!) from Luzon. In the light of this variation, it seems pointless keeping these taxa apart.

(*c*) subsp. **kinabaluensis** (Merr.) Mabberley, **comb. & stat. nov.**
C. kinabaluensis ['*kinabaluense*'] Merr. in *J. Str. Br. Roy. Asiat. Soc.* **86** : 316 (1922). Type: Malaysia, Sabah, Mt Kinabalu, Minitindok Gorge, Nov. 1915, *Clemens* 10116 (PNH!†; A!, iso) & 10490 (PNH?†; A!, K!, isopara).

Cauliflorous. High-altitude subspecies restricted to the mountains of Sabah.

Malaysia. Sabah, Kinabalu, Ulu Liwagu & Ulu Mesilan, 1500 m, *Chew, Corner & Stainton* 2827 (K!, L!, SAN!) & Keningau, Trusmadi, *Saikeh et al.* SAN 74460 (SAN!).

The populations of this tree on Mts Kinabalu and Trusmadi are both vegetatively and florally very similar to *Chisocheton cumingianus*. However, the inflorescences are always borne cauliflorously, often very close to the ground indeed, and I therefore propose that the taxon be maintained at the subspecific level. It is noteworthy that, contrary to general expectation, it is the high-altitude tree which is the truly cauliflorous taxon in this species.

29. Chisocheton patens Blume

Bijdr. : 169 (1825); Schult. & Schult., *Syst.* **7** : 83 (1829) & 1626 (1830); G. Don f., *Gen. Syst.* **1** : 685 (1831); Miq., *Fl. Ind. Bat.* **1** (2) : 537 (1859); C. DC. in DC., *Monog. Phan.* **1** : 529 & t. 7, fig. 5 (1878); Koord., in *Meded. Lands Plant.* **19** : 385 (1898); King in *J. Asiat. Soc. Bengal* **64** (2) : 34 (1895); Ridley in *J. Roy. Asiat. Soc. Str. Br.* **33** : 591 (1900); Koord.-Schum., *Syst. Verz.* III Abt. **1** : 63 (1914). Type: Indonesia, Java, *Blume s.n.* (L!, holo (photo at FHO!); G!, U!).

C. divergens Blume, *l.c.* (1825); Schult. & Schult., *op. cit.*: 83 (1829) & 1627 (1830); G. Don f., *l.c.* (1831); Miq., *l.c.* (1859); C. DC., *op. cit.* : 528 (1878); Curtis in *J. Asiat. Soc. Str. Br.* **25** : 22 (1894); King, *op. cit.* : 35 (1895); Harms in Engl. & Prantl, *Pflanzenfam.* III, **4** : 292 & t. 162, fig. H (1896) & ed. 2, **19b1** : 139, t. 30, fig. h (1940); Koord. & Val., *Boomfl. Java* **3** : 99 (1896); Brandis, *Ind. Trees* : 139 (1906); Koord.-Schum., *Syst. Verz.* I Abt. **1** (140) : 25 (1912); Backer, *Schoolfl. Java* : 208 (1911); Koord. & Val., *Atlas Baum. Java* : t. 165 (1913); Ridley, *Fl. Malay Penins.* **1** : 390 (1922); Briquet in *Mém. Inst. Nat. Genev.* **24** : 64 (1935); Backer & Bakhuizen, *Fl. Java* **2** : 124 (1965); Pennington & Styles in *Blumea* **22** : 496, t. 12, figs c & d (1975); Corner, *Seeds Dicots* **2** : t. 383 (left) (1976). Type: Indonesia, Java, *Blume s.n.* (L!, ? holo (photo at FHO!); K!, U!).

Schizochiton patens (Blume) Sprengel, *Syst.* **4** : 251 (1827); Walp., *Rep.* **1** : 429 (1842), '*Schizogiton*' in index); Miq., *Ann. Mus. Bot. Lugd.* **4** : 27, 29 (1868); Roemer, *Hesperid.* : 102 (1846).

S. divergens (Blume) Sprengel, *l.c.* (1827); Walp., *l.c.* (1842); Roemer, *l.c.* (1846); Miq., *op. cit.* : 26, 28 (1868).

[*Trichilia longissima* Wall., Cat. 8069, *nom. nud.* (1847).]

[*Cupania* sp., Wall. Cat. *l.c.* (1847).]

[*Schizochiton* ?, Wall. Cat. 9040 (1847).]

S. tetrapetalum Turcz. in *Bull. Soc. Nat. Mosc.* **1** : 411 (1858). Type: Philippines, Luzon, Tayabas Prov., 1841, *Cuming* 822 (CW, ? holo; A!, BM!, CGE!, G!, K!, L!, OXF!).

[*Melia pendula* Reinw. ex Miq., *op. cit.* : 29 (1868), *nom. in synon.*]

[*T. hexandra* Blume ex Miq., *l.c.* (1868), *nom. in synon.*]

Chisocheton fragrans Hiern in Hook. f., *Fl. Br. India* **1** : 551 (1875); C. DC., *op. cit.* : 529 (1878). Type: Malaysia, Malacca, 26 July 1867, *Maingay* '324' (K!, '324', '2459', '1382', holo; A!, BM!, CGE!, L!).

C. glomeratus Hiern, *l.c.* (1875); C. DC., *op. cit.* : 532 (1878); Curtis, *l.c.* (1894); King, *op. cit.* : 30 (1895); Ridley, *op. cit.* : 389 (1922); Briquet, *op. cit.* : 66 (1935). Type: Malaysia, Penang, *Porter* (Wall. Cat. 9040) *s.n.* (K!, holo; A!, BM!, CGE!, G!, K-W!, LE!).

C. holocalyx Hiern, *l.c.* (1875); C. DC., *op. cit.* : 530 (1878). Types: Malaysia, Malacca, 25 Aug. 1865–6, *Maingay* 1124 (K!, '326', syn) & Singapore, October, *Anderson* 30 (K!, syn; E!).

C. vrieseanus C. DC., *op. cit.* : 533 (1878); Koord. & Val., *Bidjr. Boomfl. Java* **3** : 105 (1896). Type: Indonesia, Java, *de Vriese s.n.* (K!, holo).

C. barbatus C. DC., *op. cit.* : 536 (1878). Type: Indonesia, Java, *Blume* (G!, holo; L!).

C. tetrapetalus (Turcz.) C. DC., *op. cit.* : 530 (1878); Merr., *Enum. Phil. Pl.* **2** : 368 (1923); Briquet, *op. cit.* : 65 (1935); Elmer, *Leafl. Phil. Bot.* **9** : 3347 (1937).

C. laxiflorus King, *op. cit.* : 33 (1895), *p. min. p.*, i.e. Syntype: *King's Coll.* 5765 (CALC!, G!, K!, L!, LE!).

C. divergens var. *genuinus* Valeton in Hochr., *Pl. Bogor.* : 68 (1904). Type: Indonesia, Java (BO ?, holo; CALC!, G!, K!, L!, iso.)

C. divergens var. *minor* Valeton, *l.c.* (1904). Type: Indonesia, Java (BO ?, holo; G!, K!, L!, iso).

C. divergens var. *robustus* Valeton, *l.c.* (1904); Craib in *Aberd. Univ. Studies* **57** : 36 (1912); Schmidt in *Bot. Tidskr.* **32** : 328 (1916): Craib, *Fl. Siam. Enum.* **1** : 253 (1926); Pellegr. in Humbert, *Fl. Gén. Indo-ch.*, suppl. (5) : 693 (1946). Type: Thailand, 'Siam' (BO ?, holo; G!, K!, iso).

C. fulvus Merr. in *Philip. J. Sci.* **3** : 146 (1908) & *Enum. Phil. Pl.* **2** : 367 (1923). Types: Philippines, Mindanao, Lake Lanao, Camp Keithley, May 1907, *Clemens* 1046 (PNH ?†), also 554, 583, 1062 and three *s.n.* [? inc. June 1907, G!] (PNH ?†).

C. divergens var. *patens* Ridley, *op. cit.* : 390 (1922).

[*C. urdanetensis* Elmer ex Merrill, *op. cit.* : 368 (1923), *nom. in synon.*]

[*C. apoensis* Elmer ex Merrill, *l.c.* (1923), *nom. in synon.*; Elmer, *op. cit.* : 3341 (1937), *descr. angl.*]

Tree to 35 m, but often flowering when a sapling of 2–3 m; *trunk* to 20 m and 70 cm diam., sometimes fluted and buttressed, with buttresses to 2 m high, 1 m long and 8 cm thick, concave; *bark* pale greenish to black, smooth to faintly cracked, lenticellate the lenticels in horizontal rows (Pennington), inner bark pale to dark brown, wood pale to dirty cream, often smelling of methyl captan. *Young leafy shoots c.* 6 mm diam., deciduously ± tomentose to glabrous, bark dark, cicatrices conspicuous. *Leaves* in terminal bunches, paripinnate or psuedogemmulate to 70 cm long; *rachis* pubescent to glabrous; *leaflets* in up to 14 pairs, 6–28 cm long, 2·5–10·5 cm wide,

opposite to subopposite, often maturing all together, thinly coriaceous, often paler below, narrowly oblong to oblong-lanceolate or elliptic-lanceolate, shortly acuminate; base ± unequal, ± rounded and rarely subcordate, largest leaflet with 9–14 veins on each side of midrib, ± prominent abaxially, and sunken adaxially, adaxial surface glabrous or with tomentose midrib and pubescent veins, abaxial surface glabrous to softly tawny-pubescent, midrib and veins tomentose, tertiary venation often conspicuous adaxially; *petiolule* 3–6 mm long. *Inflorescence* paniculate to 89 cm long, pendent, from upper axils or supra-axillary, pyramidal, lowermost branches to 17 cm long, 10 cm in females, tomentose to glabrous, ultimate branchlets dense, cymelike, of white to greenish cream, fragrant flowers, 6–9(–11) mm long, subsessile to shortly pedicellate, minutely bracteolate to bracteolate; *calyx* 2·5–3·0 mm long, cupular to shortly tubular, puberulous, subentire to minutely and irregularly toothed; *petals* 4, 5–10 mm long, subspathulate elliptic, glabrous to glabrescent, *staminal tube* 5–7(–8) mm long, glabrescent or minutely pubescent near mouth without and pubescent tomentellous or very rarely villous within, with (5–)6–8 long linear triangular lobes, sometimes reflexed, a little shorter than anthers; *anthers* (5–)6–7(–8), elongate, basifixed, glabrous, locellate; *ovary* obovoid, pubescent, surrounded by narrow ± lobed fleshy glabrous disk or 0; *style* cylindrical densely short, pubescent to subglabrous, stylehead cylindric to clavate, glabrous. *Fruit* to 5 cm long and 4·5 cm wide, stipitate, glabrous to tomentose (especially when immature), 2-celled, stipe to 2 cm; *seeds* 2, 5–11 mm long, 8 mm wide, scutiform, half covered by an aril.

A common tree of lowland rain forest from southern Thailand, through the wetter parts of Malesia to Sulawesi.

THAILAND. Peninsular, Phuket nr Thalang, *van Beusekom & Phengkhli* 662 (E!, K!, L!, P!). BURMA. Tavoy, *Wallich*, 1836 (Cat. 8069) *s.n.* (K-W!, LE!) & *B*. . . (?) 8213 (CALC!). INDONESIA. Sumatra, Simalur, *Achmad* 947 (U!); Musi Ili. ± 20 m, Bp 1042 (L!); Upper Riauw, Pakanbaru, Tenajan River, 30 m, *Soepadmo* 231 (A!, E!, K!, SING); nr Kajanpu, *Lütjeharms* 5246 (K!); Asahan, Mashi F.R., *Krukoff* 4355 (G!, SING!). Java, SW, Udjong Kulon, 200 m, UNESCO (*Kostermans*) 143 (A!, BM!, K!, KEP!, LAE!, SAN!, SING!). Bangka, Labokbesar, G. Pading, 20 m, *Kostermans & Anta* 1038 (A!, L!). Kalimantan, S. Borneo, Sampit River area, 100 m, *Kostermans* 8127 (K!, L!, SING!); E. Kutei, along Balikpanan, *Kostermans* 10195 (K!, SING!); W. of Samarinda, Loa Djanan River, *Kostermans* 9963 (K!, SING!) Sulawesi, Minahasa, *Koorders* 17949*β* (L!). MALAYSIA. Kedah, Lankawi, *Chelliah* FRI 6934 (K!, KEP!, SAR!); Perak, Gg Bubu *Selvaraj* FRI 11153 (K!, KEP!) & Jengka F.R., *Whitmore* FRI 6 (K!, KEP!, L!) & Tapah, *Wray* 1279 (BM!, G!); Pahang, Kemasul F.R., *Kochummen* FRI 2579A (L!) & Kuala Lipis, *Somerville* FD 10457 (K!, KEP!) & G. Benom Game Res., *Rahim* KEP 97486 (KEP!, SING!). Penang, 1888, *Curtis s.n.* (K!) & 892 (SING!); Selangor, Kuala Lumpur, Weld Hill, *Hamid* FD 10463 (K!, KEP!); Negri Sembilan, Port Dickson, Sg. Mangole F.R., *Wyatt-Smith* KEP 64782 (KEP!); Malacca, S. Udang F.R., *Sinclair* SFN 40589 (K!, SING!); Johore, Banang F.R., *Kochummen* FRI 2130 (KEP!, L!, SAN!, SING!) & Labis F.R., *Kochummen* FRI 2287 (KEP!, L!) & Endau, *Singh & Samsuri* HS 1039 (SING!, LAE!); Sarawak, Kuching, Semengoh, *Ghezalli* S 13666 (SAR!) & Ulu Kapit, 7th Divn, *Chai* S 33183 (FHO!, K!); Sabah, Kudat, *Shea & Minjulu* SAN 75986 (FHO!) & Sandakan, *Ramos* 1732 (A!) & Mostyn, Madai F.R., *Nordin* SAN 46148 (K!, SAN!) & Lahad Datu, *Cockburn* SAN 71008 (FHO!, SAN!) & Kinabalu East, *Chew, Corner & Stainton* 522 (K!, SAN!, SING!) & Ranau, *Singh & Brand* SAN 24761 (SAN!). SINGAPORE. Mandai Road, *Corner* SFN 36292 (K!, KEP!, SING!). BRUNEI. Seria, Teraja F.R., 350 m, *Hotta* 12947 (SAR!). PHILIPPINES. Luzon, Camarines, *Ramos & Edaño* BS 33871 (BM!) & Laguna, San Antonio, *Ramos* BS 23848 (FHO!) & Bataan, Lamao River, *Barnes* BS 211 (SING!) & Isabela, *Velasco* FB 29043 (K!) & Sorsogon, Mt Juban, *Edaño* PNH 37151 (K!) & Ilocos Norte, Burgos, *Ramos* BS 27340 (A!); Catanduanes, *Ramos & Edaño* BS 75391 (SING!); Babuyames, Camiguin Is., Camiguin Volczno, *Edaño* BS 79163 (SING!); Mindoro, Bongabong River, *Whitford* 1474 (SING!); Bohol, *Ramos* BS 42812 (A!); Surigao, *Wenzel* 3492 (A!, K!); Samar, Catarman, *Sulit* PNH 14344 (A!) & Mt Calbiga, *Sulit* PNH 6403 (A!); Mindanao, Zamboanga Malangos, *Ramos & Edaño* BS 37000 (A!, K!) & Agusan, Mt Urdaneta, *Elmer* 13592 (A!, BM!, G!, K!, U!) & Davao, Mt Apo, *Elmer* 10884 (A!, BM!, G!, K!, L!, U!).

Chisocheton divergens, *C. patens* (Java), *C. fragrans* and *C. holocalyx* (Malay Peninsula) were described from trees with subglabrous narrow leaflets. Material corresponding to these 'species' intergrades, some specimens having paripinnate leaves, others pseudogemmulate, some from trees with strong stercoraceous odour, some apparently without. '*Trichilia longissima*' corresponds

to *C. divergens* var. *robustus* (Thailand), which is a large form of *C. vrieseanus*, *C. divergens* var. *minor*, *C. divergens* var. *genuinuus* and *C. barbatus*, which also intergrade. These, especially on herbarium sheets like *King's Coll.* 10750 from Malaysia, cannot be separated from the type of *Schizochiton tetrapetalum* from the Philippines, a plant with more or less glabrous, shiny leaflets. In the Malay Peninsula and Sumatra, intermediates between the 'patens' group and the 'tetrapetalus' group occur (one of which was included in King's circumscription of *C. laxiflorus* = *C. sarawakanus*), and these are often pubescent, e.g. *King's Coll.* 10266, some so much so that they match the material, until now, included in the pubescent *C. glomeratus* described from the Malay Peninsula. Similarly, in the Philippines, *C. tetrapetalus* intergrades into '*C. fulvus*' in the southern part of the country.

I therefore include all the above taxa in *Chisocheton patens*, although on some islands, it may be possible, and useful, to retain distinct micro-taxa. For example, in the Malay Peninsula, most herbarium specimens can be allotted to *C. patens s. str.* or *C. glomeratus* and, in the Philippines, *C. patens s. str.* or *C. fulvus*, but, even so, there are always a number of intermediates. The variation pattern somewhat resembles that recorded for *C. lasiocarpus* (*q.v.*) but is not as intractable as in that perplexing group.

N.B. Chisocheton patens was selected as lectotype species for the genus *Chisocheton* by Airy Shaw (1937) as type of the type section 'Euchisocheton' which thus antedates Harms's selection of *C. divergens* (1940). Koorders (*Bidjr. Baum.*, 1896) wrote that *C. patens* was merely a female form of *C. divergens*, but in *Meded. Lands Plant.* (1898) reduced the latter to a synonym of the former species thus making Ridley's decision to relegate *C. patens* to varietal status of *C. divergens* an error.

Some specimens from Sarawak, particularly from the Semengoh Forest Reserve near Kuching, are curious for their large coriaceous leaflets resembling those of material collected from very large trees in northern and eastern Borneo, except that the venation on the adaxial surface is not pubescent. These specimens come from treelets to 3 m high and deserve further study: *Banyeng & Sibat* S 27053 (FHO!), *Mabberley* 1590 and 1595 (both FHO!). The other trees are different from the main corpus of *Chisocheton patens*, however, and I distinguish them as a new species (*vide infra*).

30. Chisocheton lansiifolius Mabberley, **sp. nov.**

(Fig. 5). A *C. patento* Blume foliolis valde majoribus acuminatis, nervatura foliolorum prominente utrinque, calyce minore, seminibus majoribus differt.

Arbor ad 18 m altus. *Truncus* ad 25 cm diam., interdum striatus et anteribus concavis ad 2 m altis, circa 5 cm latis praeditus; *cortex* fusca, rasilis desquamatave. *Ramuli* umbrini, lenticellati, cicatricosi, foliati circa 0·8 cm diam. *Folia* ad 54 cm longa, paripinnata, ? pseudogemmulata,* foliolis usque ad 5-jugis; *foliola* coriacea, una crescentia, avellanea ubi exsiccata, nervatura prominente utrinque, lamina subglabra usque ad 42·0 × 10·5 cm, oblonga-elliptica vel -ovata, valde acuminata, acumine ad 18 mm longo, nervis secundariis usque ad 10(–14) utrinque, arcuatis. *Inflorescentia* ad 65 cm longa, paniculata; *ramuli* ubi proximi ad 18 cm longi, squarrosi, ramulis sensim fasciculos 1–6 floribus praeditos transientibus, ubi distali minores et ipsi fasciculatos similes transientes; *calyx* circa 1·5 mm longus, cupulatus, rugosus, margine obscure quadrilobata; *corolla* erminea interdum subrosea, petalis, 4, 8–9 mm × 1·5 mm basi connatis, extus leviter pubescentibus, intus glabris; *tubus staminalis* 5·0–5·5 mm longus, apice cum 6 lobulis, circa 2 mm longis, integris, praeditus, intus gossypine pubescens, extus vix; *antherae* 6, circa 2·5 mm longae, inter lobulos insertae, glabrae, vix locellatae; *discus* annularis tumidus; *stylus* 7·5–8·0 mm longus, teres, pilis in tribus quadrantibus proximis praeditus, stigma subcylindrica. *Infructescentia* ad 85 cm longa; *axis* circa 8 mm diam., pendens; *rami* 1–2 fructus ferentes; *capsula* ad 5 cm diam., stipitata, ruber, quadrivalvis, seminibus duobus, scutatis circa 3 cm diam., praedita.

Type: Malaysia, Sarawak, 3rd Divn, Balleh, Ulu Mujong, N. Temiai, 'occasionally flooded clay

*Cicatricem pseudogemmulae tantummodo vidi.

Fig. 5 *Chisocheton lansiifolius* Mabberley. Flower to $\frac{1}{1\cdot 2}$ scale; half base flower, tube and pistil to $\frac{1}{0\cdot 4}$ scale.

alluvium, very old secondary forest, *c.* 250 m alt.', 10 March 1964, *P. S. Ashton* S 12141 (K!, holo; A!, FHO!, L!, SAN!, SAR!, SING!; duplicates also deposited BO, KEP, MEL).

Primary and old secondary forest including peat swamp forest to 100 m. Northern and eastern Borneo. First collected by F. H. Endert in 1925.

The specific name refers to the similarity between the leaflets of this species and the leaves of *Lansium* spp. and other *Aglaiaeae*, e.g. *Aglaia oligophylla* Miq. (*Aphanamixis reticulosa* Kost.), noted by collectors.

Indonesia. Kalimantan, Sangkulirang Dist., G. Medadam, N. of Sangkulirang, 100 m, *Kostermans* 13249 (L!, SING!) & W. Kutai, Kombeng, *c.* 30 m, *Endert* 5127 (L!) & E. Kutei, Sg Susuk region, 10 m, *Kostermans* 5490 (SING!). Malaysia. Sarawak, Beram Dist., Tinjar, *Tong* S 34950 (FHO!, SAR!); Sabah, Lamag, River Kinabatangan, *Jaswir* SAN 30737 (K!, L!, SAN!) & Kalumpang, mile 15, Tawau Rd, *Muin Chai* SAN 26978 (K!, SAN!) & Sandakan, Sg Tabing, *Ah Wing* SAN 34971 (SAN!) & Mt Kinabalu, Kinataki stream, *c.* 1000 m, *Carr* SFN 26817 (SING!).

31. Chisocheton granatum Mabberley, **sp. nov.**
(Fig. 6). A *C. sarawakano* Harms nervis secundariis pluribus, ovario 5-mero, capsula majore seminibus exarillatis pluribus, differt.

Arbor ad 12 m altus. *Truncus* ad 8 m altus, 17 cm diam.; *cortex* cinerascens, rasilis desquamatave. *Ramuli* fusci, lenticellati, ubi foliferentes circa 6 mm diam. *Folia* spiris laxis terminalibus portata, ad 120 cm longa, pseudogemmulata, plus minusve pubescentia, foliolis usque ad 12-jugis, pseudogemmula singulariter circinale; *foliola* ad 24 cm × 7·5 cm, oblonga vel oblonga-ovata, abaxiale exsiccata pallentia, apice obtuse acuminato, base cuneata, aliquantum asymmetrica, nervis secundariis usque ad 22 utrinque, vadose arcuatis, marginem fere attingentibus, abaxiale prominentibus. *Inflorescentia* ad 25 cm longa, supra-axillaris, prope axillas foliorum immaturorum orta; *ramuli* proximi ad 6 cm longi (♂) vel glomeruli breves (♀); *calyx* 2·5–3·0 mm longus, campanulatus, pubescens, margine truncato; *corolla* 12–16 mm longa, clavata (♂), erminea, petalis 4, circa 3·5 mm latis, imbricatis, spathulatis-linearibus, extus pubescentibus; *tubus staminalis* 9·0–12·5 mm longus, prope antheras inflatus, extus dimidio distale pubescens, intus glaber, margine obscure lobato truncatove; *antherae* 6, 1·5 mm longae, oblongae, locellatae, glabrae; *discus* obscurus; *ovarium* 5-merum, stylum pilis in tribus quandrantibus proximis praeditum, transiens; *stigma* breviter cylindrica, glabra, apice lobata. *Fructus* ad 9 cm diam., complanato-globosus, suturis quinque praeditus; *pericarpium* glabrum tenax, extus ictericum, intus album, sine latice albo; *semina* 4–5, circa 3 cm longa, scutata (ubi 4) vel formam segmentae hesperidii simulans (ubi 5), cotyledonibus laticiferibus.

Typus: Malaysia, Sabah, Mt Kinabalu, 'Dallas, 3000", 28 Nov. 1931, *Clemens* 27299 (K!, holo (photo at FHO!); A!, B!, BM!, G!).

Hill forest of the Mt Kinabalu area, Borneo.

Malaysia. Sabah, Mt Kinabalu, 'Dallas 3000", *Clemens* 26080 (BM!, K!), 26428 (BM!) & 26814 (K!) & 27015 (A!, BM!, K!) & 'Tenompok 5000", *Clemens* 30218 (A!) & Ranau, road below hot springs, *Pennington* 7941 (FHO!).

N.B. The specific epithet is a substantive, referring to the superficial resemblance of the fruit to that of *Xylocarpus granatum* Koen. (*Granatum* of Rumpf).

(iii) sect. **Dasycoleum** (Turcz.) Harms
In Engl. & Prantl, *Pflanzenfam.* III, **4** : 296 (1896).
Dasycoleum Turcz. (genus) in *Bull. Soc. Nat. Mosc.* **31** : 414 (1858). Type (obligate lectotype): *D. philippinum* Turcz., i.e. *C. pentandrus* (Blanco) Merr.
§*Holopentas* Miq., *Ann. Mus. Bot. Lugd.* **4** : 27 (1868).

Trees or treelets, pachycaul to slender leptocaul, usually with white latex. *Indumentum* of simple hairs. *Leaves* psuedogemmulate. *Inflorescences* axillary or supra-axillary; *petals* in 1–2 whorls, imbricate to valvate; *tube* lobed or not; anthers glabrous, locellate; *disk* obscure to shallowly cupulate; *ovary* 2–9(–11)-locular. *Fruit* laticiferous; *seeds* sarcotestal.

Twelve species; Indochina throughout Malesia to Papua New Guinea.

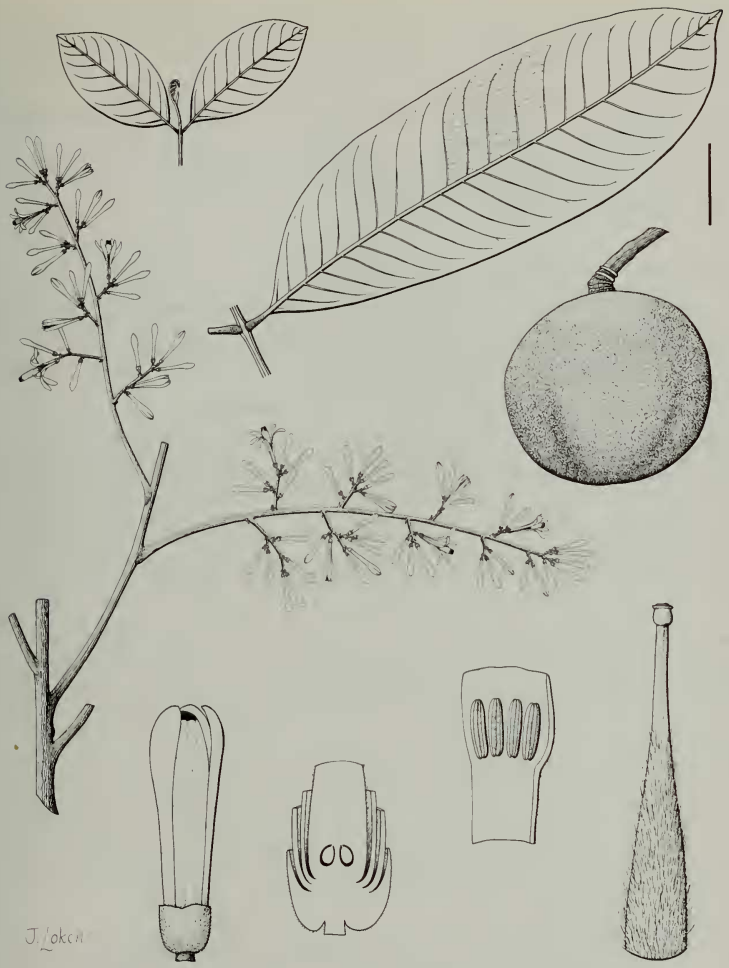

Fig. 6 *Chisocheton granatum* Mabberley. Leaf apex, lateral leaflet and fruit from *Pennington* 7941, inflorescence from *Clemens* 27299–30212 (scale = 3 cm); flower (scale = 5·0 mm), half flower base, part tube and pistil (scale = 2·5 mm) from latter.

Key to series

Corolla enclosing at least one petal, imbricate; tube weakly lobed or unlobed, stylehead discoid or subcapitate (*a*) **Pauciflori**

Petals valvate; tube conspicuously lobed; stylehead capitate (*b*) **Sandoricocarpi**

(*a*) ser. **Pauciflori** Harms

Op. cit.: 295 (1896, in sect. '*Euchisocheton*'), *p.p.*, *non sensu* Harms (1940), i.e. *ser. seq.* Type (selected here): *C. pauciflorus* King.

[§*Grandiflori* Harms, *op. cit.*, ed. 2, **19** (1): 151 (1940, *nom. non rite publ.* (*descr. germ.*))]

Corolla of 1–2 whorls, including at least one petal, imbricate; *tube* weakly lobed; *stylehead* discoid to subcapitate.

Five species from S. Burma to Sulawesi.

32. Chisocheton perakensis (Hemsley) Mabberley, **comb. nov.**

Megaphyllaea perakensis Hemsley in Hook., *Ic. Pl.* 18, t. 1708 (1887); King in *J. As. Soc. Bengal* **64** (2) : 24 (1895); Ridley, *Fl. Malay Penin.* **1** : 386 (1922); Burkill & Henderson in *Gdns' Bull. Str. Sett.* **3** : 356 (1925); Pennington & Styles in *Blumea* **22** : 496, fig. 12e (1975). Type: Malaysia, Perak, Larut, 'Hill Garden', 900 m, 1885, *L. Wray f.* 504 (K!, holo photo at FHO)).

C. annulatus King, *op. cit.* : 31 (1895); Types: Malaysia, Perak, Maxwell's Hill, 900 m, May 1889, *Curtis* 2693 (CALC!, syn; SING!) and *s. loc.*, *Scortechini s.n.* (CALC!, syn).

M. annulata (King) Ridley, *l.c.* (1922); Burkhill & Henderson, *l.c.* (1925).

Pachycaul tree to 15 m high with sparse and somewhat fastigiate branching. *Leafy twigs c.* 1 cm diam., with white exudate. *Leaves* to 2 m long, at least 7-jugate, pseudogemmulate, with compressed petiole and rachis, glabrous to pubescent; *leaflets* to 38 cm long, 10 cm wide, oblong to elliptic-oblong, subcoriaceous, weakly asymmetric, subacute, shortly acuminate, base cuneate, shortly petiolulate, petiolule to 15 mm, *costae* 10–14 on each side, rather oblique, prominent below. *Inflorescences* to 75 cm, supra-axillary, pendent, puberulous, sparsely 1–2-branched (♂) or unbranched (♀); *main rachis* 4-angled, compressed; *lowermost branches* to 12 cm long, few-flowered; *pedicel* 7–10 mm; *flowers* laticiferous, sweetly scented somewhat larger in ♀ infls.; *calyx* clavate, extended into a stout pseudopedicel *c.* 10 mm long below, campanulate to shortly cylindrical above where *c.* 6 mm high, 9 mm diam., puberulous to rusty-tomentose outside, with thickened wavy median band, apex completely enclosing corolla in bud and splitting into *c.* 4 irregularly triangular teeth *c.* 5 mm high; *petals* white adhering to base of staminal tube, in two ranks, 3 outer 14–24 mm × 7–8 mm, oblong-spathulate, rounded, tomentellous without, glabrous within, fleshy, inner (3–)4–7 10–18 mm × 3–5 mm, narrowly oblong-spathulate, glabrous; *staminal tube* 8–16 mm high, 5–7 mm diam., obscurely crenulate or with lobes to 1 mm high, glabrous without, sparsely pilose within below anthers; *anthers* 10–13, *c.* 2·5 mm long, linear-oblong, locellate, glabrous, included *c.* 1 mm inside tube, basifixed, pollenless in ♀; *disk* shallow to obscure, pubescent; *ovary c.* 9 mm tall, 3 mm diam. (♀), or rudimentary (♂), 7–9-locular; *style* terete, pubescent below; *stylehead c.* 1·5 mm across, discoid, glabrous. *Fruit c.* 8 cm diam., flattened-globose, borne singly or in pairs, densely but minutely tomentose; *pericarp* thick, leathery, exuding white latex on cutting; *seeds c.* 2·5 cm long, shaped like the segment of an orange, one per loculus, with vascular sarcotesta and large hilum; *cotyledons* free, superposed.

Restricted to hill-forest, 900–1150m in Maxwell's Hill area, Malaysia.

Malaysia. Perak, 'Thaiping Hills', *King's Coll.* 5305 (G!, L!, LE!, SING!), 6317 (G!, K!, L!, SING!) 8320 (L!); *Ridley* 11962 (K!); Larut, 'Hill Garden', *Wray* 504 (K!, holotype) & 504A (K!); Pahang, Maxwell's Hill, 900 m, *Curtis* 2693 (SING!) & mile $5\frac{1}{4}$, *Kochummen* FRI 2876 (K!, KEP!) & *Wray s.n.* (SING!); Ridley 5358 (SING!) above Maxwell's Hill, *Ridley* 11963 (SING!) & Birch's Hill, 1140 m, *Burkill & Haniff* 12985 (K!, KEP!, SING!) & s. loc., *Scortechini s.n.* (SING!).

33. Chisocheton sarasinorum Harms

In *Fedde, Repert.* **42** : 8 (1937). Type: Indonesia, Sulawesi, 'Nördlicher Gebirgsabfall gegen Bada', Sept. 1902, *K. F. & B. P. Sarasin* 2137 (B?†, holo).

Pachycaul treelet to *small tree* 15 m high with open crown. *Bark* smooth, greyish green; *inner bark* pale brown; *wood* pale fawn. *Twigs* rather rough, brown, with vertical lenticels, leafy ones *c.* 8 mm diam. *Leaves* in terminal spirals to 150 cm long, at least 7-jugate, pseudogemmulate, dull above, pale below; *rachis* green, subglabrous to weakly pilose; *petiole* to 20 cm long or more, subglabrous to weakly pilose; *leaflets* petiolulate, petiolule to 15 mm, sometimes pubescent, lamina 10–28 cm long, 3·5–10 cm wide, oblong or oblong-lanceolate, glabrous or subglabrous when sparsely pubescent on the veins, base acute or weakly obtuse, apex acuminate, costae *c.* 15 on each side of main vein, prominent and drying pale below. *Inflorescences* axillary to supra-axillary, narrow to 35 cm long, sparsely branched, lower branches to 14 cm, ascendant, weakly pilose to subglabrous, few-flowered, each with 1–4 white flowers, *c.* 18–22 mm long; *pedicels* short, stout *c.* 2–3 mm long; *calyx* 5–6 mm long, 7–8 mm wide, shallowly cupular, densely tomentose outside, margin truncate to obscurely undulate; *petals* (5–)6 adhering to tube at base, in two ranks, *outer* 3 – 16–20 mm long, 6 mm wide, narrowly oblong, obtuse, *inner* (2–)3 – 14–18 mm long, almost linear, obtuse, apex hooded; *staminal tube* 12–15 mm high, thick, tough, margin truncate to obscurely dentate, glabrous to subglabrous outside, laxly pilose within below; *anthers* 8–10(–11), 2–2·5 mm long, linear, included, basifixed; *ovary* and style-base densely villose; *stylehead* discoid to stoutly cylindrical. *Fruit* to 8 cm diam., 7 cm long, flattened-globose, 6–8-locular, borne singly or in pairs on rachis to 20 cm long, and 8 mm diam.; *pericarp c.* 4 mm thick, tough, greenish-brown velutinous, exuding white latex on cutting; *seed* to 5 cm long, like a segment of an orange, with vascular sarcotesta.

Swampy and hill forest, sometimes disturbed, to 1150 m, north-eastern Borneo and Sulawesi.

INDONESIA. Kalimantan East, nr Teluk Bajur, Berau, *Kostermans* 21585 (SAR!). MALAYSIA. Sabah, Sandakan, Kabili, *Castro* SAN A43 (K!, SING!) & Sepilok, *Meijer* SAN 34298 (SAN!) & *Pennington*, 7910 (FHO!, SAN!) & Lungmanis, 1150 m, *Ah Wing* SAN 29528 (K!, SAN!); Sarawak, 5th Divn Lawas, Bangkor, Kong Khaw area *Chai & Ilias* S31577 (FHO! SAR!).

The Indonesian material is nearer the type in being marginally more pubescent than the material from Sabah.

The leaves closely resemble those of *Chisocheton ceramicus* and sterile material can be easily confused.

34. Chisocheton pauciflorus King

In *J. As. Soc. Beng.* **64** (2) : 27 (1895); Ridley in *J. As. Soc. Str. Br.* **33** : 59 (1900) & *Fl. Malay Penin.* **1** : 387 (1922). Types: Malaysia, Perak, *Scortechini s.n.* (CALC, CGE!, E!, K [ex SING]!), 90–150 m, July 1882, *King's Coll.* 3128 (BM! CALC, K! (photo at FHO!), U!), 30–90 m, Sept. 1882, 3313 (CALC, K! (photo at FHO!)), 3396 (CALC), 150–240 m, Oct. 11882, 3467 (CALC, K! (photo at FHO!)), 150–240 m, June 1883, 4455 (CALC, L!, SING!).

Leptocaul shrub to *small tree* 17 m tall, d.b.h. to 20 cm. *Bark* dark brown to reddish, smooth; *inner bark* red; *wood* white. *Leaf-bearing twigs* about 3 mm diam., puberulous, blackish: when dry. *Leaves* to 38 cm long and 5-jugate, pseudogemmulate; *leaflets* to 25 cm long and 10 cm wide, but usually much smaller, oblanceolate or oblong-lanceolate to elliptic-ovate, adaxial surface glabrous, shining, the abaxial paler, glabrescent, reticulate, puberulous on veins, apex shortly acuminate base cuneate, costae 5–8 on each side of midrib, arcuate and slightly prominent below. *Inflorescences* 2–13 cm long, supra-axillary, puberulous, 1–6-flowered. *Flowers* about 2 cm long, waxy and heavily scented; *pedicel* 6–12 mm, puberulous; *calyx c.* 6 mm long and wide, tubular, fleshy, tomentose on the outside, margin truncate to obscurely 5-lobed, enveloping petals in bud, accrescent in fruit; *petals* (4–)5–6 white, waxy, in two ranks of 3 outer and (1–)2–3 inner, outer *c.* 18 mm long and 6 mm wide, spathulate-elliptic to elliptic, minutely tomentose outside, glabrous within, inner *c.* 17 mm long and 3–5 mm wide, narrowly spathulate-elliptic, glabrous except for longitudinal median band of minute tomentum in those flowers where inner rank is partly exposed through gaps between the outer petals, all blunt and weakly overlapping at apex; *staminal tube* a little shorter than petals, obscurely lobed at apex, glabrous except for sparse pubescence within below anthers; *anthers* (4–)8–10, *c.* 1·5 mm long, narrowly elliptic to linear, weakly locellate, basifixed, included below lobes, glabrous; *disk* small, flat, tomentose; *ovary* and *style* pubescent

except for glabrous band below the discoid to shortly cylindrical stylehead. *Fruit* elliptic rostrate, tomentose with persistent and sometimes accrescent calyx when young, spherical and at least 1 cm diam., when mature; *seeds* unknown.

Primary forest to 550 m, west and south of Malay Peninsula, formerly (?) occurring in Singapore.

Malaysia. Kedah, Gn. Busong, *Loh* FRI 6886 (K!, KEP!, L!, SING!) & 6974 (K!, KEP!, SING!); Perak, Larut, *King's Coll.* 2876 (BM!, G!, K!), 3128 (K!, U!), 3313 (K!), 3467 (K!), 4455 (SING!), 11067 (K!); Pahang, Jerantut, *Holttum* SFN 24755 (SING!); Selangor, Ulu Gombak, *Ahmad* KEP 99006 (K!, KEP!, SING!), Kajang, *Symington* KEP 24124 (SING!); Malacca, Bt. Seggeh F.R., *Kiah* SFN 37220 (A!, K!, KEP!, LAE!, SING!); Johore, Kulai, *Corner* SFN 29959 (K!, LAE!, SING!) Labis F.R., Ulu Endau, *Ogata* KEP 110338 (KEP!, L!).

35. Chisocheton diversifolius Miq.

Fl. Ind. Bat., supp. **1** : 196, 504 (1861, 'diversifolium'); C. DC. in DC., *Monog. Phan.* **1** : 538 (1878). Type: Indonesia, Sumatra, nr Lubualang, *Teijsmann s.n.* (U!, holo (photo at FHO!)).
Schizochiton diversifolium (Miq.) Miq., *Ann. Mus. Bot.* **4** : 27, 31 (1868).

Leptocaul (?) *shrubby tree. Twigs c.* 4 mm diam. *Leaves* to 47 cm long; *petiole* weakly pubescent; *leaflets* in up to 9 pairs, alternate to subopposite proximally, opposite distally, petiolulate, to 15 cm long and 4 cm wide, oblong-lanceolate, apex acuminate, base acute, costae about 12 on each side. *Inflorescence* a panicle of cymes with very short distal branches and sessile distal cymules, *pedicel* densely pubescent; 3–5 mm high, densely pubescent, obconical to campanulate, margin entire; *petals* 4–5, 8 mm long, 3 mm wide, spathulate-linear, two often narrower than the others, imbricate, white; *staminal tube* 5–6-dentate, teeth retuse, glabrous to very sparsely pubescent without; *anthers* 5–6, 2 mm long, linear, locellate, glabrous, included; *ovary* pubescent; *style* hirtellous, stylehead capitate to subdiscoid. *Fruit* unknown.

Indonesia. Sumatra, *sine loc.*, *Korthals s.n.* (A!, L! (Herb. Lugd. Bat. 908132–749, 908132–778 & 908132–788), LE!, U!).

It is remarkable that this tree has not been collected again. The leaves may be confused with those of *Chisocheton pentandrus* subsp. *paucijugus*, but those have larger and fewer leaflets.

36. Chisocheton grandiflorus (Kurz) Hiern

In Hook. f., *Fl. Br. India* **1** : 552 (1875); C. DC. in DC., *Monog. Phan.* **1** : 534 (1878); *Andamans & Nicobar Gaz.* April 1900 (1900); Kloss, *Andamans & Nicobars* : 336 (1903); Brandis, *Ind. Trees* : 139 (1906); Parkinson, *For. Fl. Andamans* : 119 (1923). Lectotype (selected here): Burma, Tenasserim, Tavoy, 22 Oct. 1827, *Gomez* '355' [Wall. Cat. 1271] (K-W!; BM! ['Tavoy' (photo at FHO!)], LE! ['Tavoy']).
[*Plagiotaxis grandiflora* Wall., *Cat.* 1271 (1829), *nom. nud.*; [Wall. ex] W. & A., *Prodr.* **1** : 123 (1834), *in obs., nom. in synon.*]
[*Dysoxylum grandiflorum* Arnott ex Steud., *Nomencl.*, ed. 2 : 534 (1840), *nom. nud.*: M. J. Roem., *Hesperid.* : 101, 135 (1846), *nom. nud.*]
[*Epicharis* sp., Kurz, *Rep. Veg. Andam.*, ed. 1 : iv (1867).]
[*Chisogeton grandiflorum* Wall. ex Kurz, *op. cit.*, ed. 2 : 33 (1870), *nom. nud.*]
[*Diplotaxis grandiflora* Wall. ex Kurz, *l.c.*, *sphalm.*, *nom. in synon.*]
Schizochiton grandiflorum Kurz in *J. As. Soc. Bengal* **41** : 296 (1872) & in *op. cit.* **44** : 145 (1875) & *For. Fl. Burma* **1** : 216 (1877).
[*Chisocheton grandifolius* Lace, *List Trees Burma* : 26 (1914), *sphalm.*]

Tree to 13 m high. *Twigs c.* 6 mm diam., tawny-velutinous. *Leaves* to at least 55 cm long, pseudogemmulate; *rachis* terete, tawny pubescent; *leaflets* in up to at least 6 pairs, shortly petiolulate to 5 mm, to 24 cm long, 8 cm wide, narrowly oblong-elliptical, apex acute to subacuminate, base weakly asymmetrical, tawny pubescent abaxially, costae to 18 on each side, arcuate, ascending, weakly sunken adaxially, prominent abaxially. *Inflorescence* to at least 32 cm long, sparsely branched, pendent ± supra-axillary; *rachis* 2·5 mm diam., densely tawny velutinous, with flowers rather crowded at apex; proximal *bracts* to 3 mm long; *pedicel* and *pseudopedicel* ± absent; *calyx* 5–6·5 mm tall, cupuliform, ± 4–5-toothed or entire, densely fulvescent-tomentose without, margin

ciliate; *petals* 5–6, 12–14 mm long, *c.* 4 mm wide, linear spathulate, alternative, inner 1–2 *c.* 12·5 mm long, 2·5 mm wide, all densely pubescent without; *staminal tube* crenulate or weakly 6–7-lobed, thick and fleshy lobes truncate, pilose without except most proximally, glabrous within; *anthers* 6–8, 3–4 mm long, glabrous, locellate; *disk* cupuliform, adnate to ovary, glabrous; *style* adpressed pubescent, stylehead 1 mm diam., subcapitate. *Fruit* 'large apple-like' (Rock), '3-lobed pyriform, 3-valved' (Hiern) [*non vidi*].

Known only from the following collections.

BURMA. Tavoy, *Gomez* '355' (type). THAILAND. 'Between Ban Doi, Chang Doi & Ban Mai Kit (Chang Sen Luang)', 18 Jan. 1922, *Rock* 1867 (A!).

Despite Kurz's and Parkinson's reports, I have not seen any specimens from the Andamans.

Though providing a description and suggesting that Wallich's unpublished *Plagiotaxis grandiflora* probably belongs to *Dysoxylum*, Wight & Arnott, *Prodr.* (1834), did not take up *Dysoxylum grandiflorum*, the name which was used by Steudel and Roemer but without reference to Wight & Arnott.

37. Chisocheton mendozai Hildebr.

In van Steenis in *Philip. J. Sci.* **91** : 509 (1963). Type as below.

Amoora fulva Merr. in *Philip. J. Sci., Bot.* **11** : 187 (1916), *Enum. Phil. Fl. Pl.* **2** : 370 (1923), *non C. fulvus* Merr., i.e. *C. patens* Blume Type: Philippines, Samar, Catubig River, Pinipisakan, 21 March 1916, *Ramos* Bur. Sci. 24497 (PNH?†; BM!, K!, L!, SING!).

Tree c. 9 m high; d.b.h. 25 cm. *Twigs c.* 9 mm diam. *Leaves* to at least 20 cm long with large densely tomentose pseudogemmula; *leaflets* in up to at least 3 pairs to 20 cm long and 9 cm wide, elliptic, apex acuminate, petiolulate, bright rusty-tomentose when expanding, costae up to 12 on each side, tertiary venation very conspicuous. *Inflorescence* to 40 cm long, strongly supra-axillary, twice branched; *branches* to 6 cm long, fulvous; *calyx c.* 3·5 mm tall, obscurely lobed to praemorse, cupulate; *petals* 5, *c.* 18 mm long, oblong-spathulate, 3 valvate, 1 ± enclosed, 1 enclosed, sericeous without, glabrous within, fleshy; *staminal tube* with five lobes 3 mm long, entire, pilose without to half-way up teeth, pubescent within to just below anthers; *anthers* 5, locellate, *c.* 3 mm long, narrowly oblong, sub-basally attached to tube; *ovary* and *style* hairy to just below sub-cylindrical stylehead, 1 mm diam. *Fruit* unknown.

Known only from Samar.

PHILIPPINES. Samar, Catubig River, *Ramos* 24497 (type) & Oquendo, Mt Mahagna, 27 April 1951, *Sulit* (4293) PNH 14459 (A!, BM!, K!, L!).

(*b*) ser. **Sandoricocarpi** Harms ex Mabberley, **ser. nov.**

Harms in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, **19**b1 : 153 (1940), *sine descr. latin.*

§*Pauciflori sensu* Harms, *op. cit.* : 151 (1940), *non* Harms (1896).

§*Dasycolei* Harms, *op. cit.* : 153 (1940).

A ser. *Paucifloris* corolla valvata, tubo staminalis lobato differt. Type: *C. sandoricocarpus* Koord. & Valeton, i.e. *C. ceramicus* (Miq.) C. DC.

Seven species from Indochina through Malesia to New Britain.

38. Chisocheton vindictae Mabberley, **sp. nov.**

(Fig. 7.) A ceteribus speciebus ser. *Sandoricocarporum*, inflorescentia longa, calyce magno, differt.

Arbor . . . *Ramuli foliati* circa 12 mm diam. *Folia* ad 51 cm longa, ? pseudogemmulata; *foliola* ad 21 cm × 7·5 cm, elliptico-ovata, subglabra pilis sparsissimis praedita, apice breviter abrupteque acuminata, base cuneata, petiolulo 5–7 mm longo, costa adaxiale depressa, nervis secundariis circa 11 utrinque, ascendentibus, abaxiale prominentibus. *Inflorescentia* circa 105 cm longa, thyrsiformis, pendens, pauciramosa; *rami* ad 11 cm longi (proxissimi), subsquarrosi, pauciflori vel uniflori (distissimi); *rhachis* circa 4·5 mm diam., teres, subglaber; (? *pseudo-pedicellus* circa 4 mm × 4 mm; *flores* (feminei solum cogniti) 2 cm longi; *calyx* 4·5 mm longus, 6·5 mm diam.,

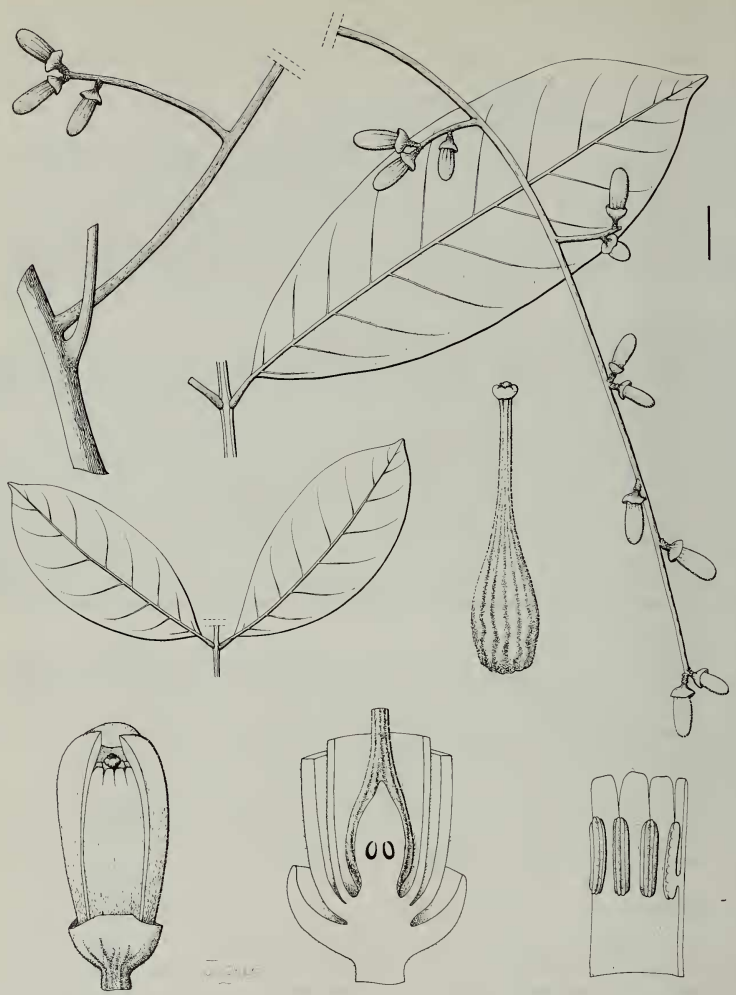

Fig. 7 *Chisocheton vindictae* Mabberley. From *Pringgo Atmodjo* 428: leaf apex, lateral leaflet and inflorescence (scale = 2 cm), flower (scale = 5·0 mm), half flower base, pistil and part tube (scale = 2·5 mm).

vadosissime cupulatus, extus plus minusve pubescens, margine integro vel obscure lobato; *petala* 6, 18 mm longa, naviculiformia, carnosa, valvata, extus pubescentia; *tubus staminalis* circa 12 mm longus, 7 lobis, circa 1·5 mm longis, truncatis vel parum bilobatis praeditus, intus extusve dense pubescens, sed lobis sparsissime pubescentibus; *antherae* 7, 3 mm longae, apice basive parum bilobatae, prope basifixae, glabrae, locellatae; *discus* 2 mm altus, stipitatus; *pistillum* 8 mm longum, ovario 11-porcato, dense pubescente, stylo subglabro, terete, stigma 1·5 mm diam., breviter cylindrico-subdiscoidea, glabra, mammilla apicale praedita. *Fructus* ignotus.

TYPE: Indonesia, Sumatra, Atjeh, 'Alaslanden (Lawé, Kingo)', i.e. Bambel area (*fide Fl. malesiana* I, **1** : 417), 17 June 1904, *Pringgo Atmodjo* 428 'coll. 83' (L!, holo (photo at FHO!)).

Only known from the type material* collected on Lt. Col. G. C. E. van Daalen's punitive expedition to northern Sumatra, commemorated in the specific epithet.

39. Chisocheton ceramicus (Miq.) C. DC.

In DC., *Monog. Phan.* **1** : 533 (1878); Stevens in *Contrib. Herb. Aust.* **11** : 9 (1975); Johns, *Comm. For. Trees Papua New Guinea* 5 : 210, 217 (1976). Type as below.

Schizochiton ceramicum Miq., *Ann. Mus. Bot. Lugd. Bat.* **4** : 27, 29 (1868). Type: Indonesia, Seram, 'Teysmann et de Vriese'. Sheet labelled Teysmann at U!, ?holo; CALC! & L!.

S. spectabile Miq., *ll. cc.* (1868). Type: Indonesia, Kalimantan, River Doessen area, *Korthals* (U!, ? holo; L! '121').

C. spectabilis (Miq.) C. DC., *op. cit.* : 539 (1878); Merr. in *J. Str. Br. R. Asiat. Soc.* **spec. no** : 320 (1921); Meijer in *Bot. News Bull. Sabah* **8** : 78 (1967).

S. junghuhnii Miq., *op. cit.* : 27, 30 (1868). Type: Indonesia, Sumatra, Upper Angkola, *Junghuhn* (U!, ? holo; L!).

C. junghuhnii (Miq.) C. DC., *op. cit.* : 533 (1878).

C. macrothyrsus King in *J. Asiat. Soc. Bengal* **64** (2) : 33 (1895); Koord. & Val., *Atlas Banmg. Java*, t. 166 (1913); Ridley, *Fl. Malay Penin.* **1** : 389 (1922); Burkill & Henderson in *Gdns' Bull. Str. Sett.* **3** : 356 (1925). Types: '*Scortechini* [Maxwell's Hill, 900 m, *s.n.* (CALC!, ? syn; BM!, K!), '314' (G!), '433' (G!)], *Wray* [3289 & *s.n.* (both CALC!), ? syn], *King's Coll.* [2634 (CALC!, ? syn; G!) & 3187 (G!, K!)]'.

C. sandoricocarpus Koord. & Valeton in *Meded. Lands Plant.* **16** : 111 (1896); Backer, *Schoolfl. Java* : 209 (1911); Koord., *Exc. Fl. Java* **2** : 443 (1912); Koord.-Schum., *Syst. Verz.* 1 Abt. **1** (140) : 29 (1912); Backer & Bakh., *Fl. Java* **2** : 124 (1965); Corner, *Seeds Dicots.* **2** : t. 383 (right) (1976). Types: according to specimens preserved at L(!), description based on the following *Koorders* Java collections (BO, ? syn): 4887*β* (also K!), 4998*β*, 6020*β* (also K!), 28674*β* & 28985*β*.

? *C. globosus* Pierre, *Fl. Cochinch.* t. 347A (1896); Pellegrin in Lecomte, *Fl. Gén. Indo-Chine* **1** : 740 (1911) Briquet, *Mém. Inst. Nat. Genev.* **24** : 66 (1935). Type: Viet Nam, Annam, Bien Hoa, towards Chias Xan & Binh Thuan, Feb. 1877, *Pierre* 1619 (P!, holo!; BM!, E, G!, K!, L!, LE!).

C. clementis Merr. in *Philip. J. Sci.* **3** : 145 (1908) & *Enum. Phil. Fl. Pl.* **2** : 367 (1923); Briquet, *op. cit.* : 67 (1935); Elmer, *Leafl. Philip. Bot.* **9** : 3345 (1937); Heine in *Fedde. Rep.* **54** : 230 (1951). Type: Philippines, Mindanao, Lake Lanao, Camp Keithley, July - 7 Sept. 1907, *Clemens s.n.* (PNH†, G!, ? isosyn).

Amoora cupulifera Merr. in *Philip. J. Sci. Bot.* 9 : 365 (1914) & *Enum. Phil. Fl. Pl.* **2** : 370 (1923); Briquet, *op. cit.* : 76 (1935). Type: Philippines, Leyte, Dagami, 3 Aug. 1913, *Wenzel* 311 (PNH†; A!, BM!, G!).

[*C. vulcanicus* Elmer ex Merr., *Enum. Phil. Fl. Pl.* **2** : 367 (1923), *nom. in synon.*]

A. mindorensis Merr. in *Philip. J. Sci.* **27** : 459 (1925). Type: Philippines, Mindoro, Pinamalayan, 21 May 1922, *Ramos* BS40860 (PNH†, A!, K!).

C. aff. biroi, Lane-Poole, *Rep. For. Res. Terr. Papua New Guinea* : 100 (1925).

C. peekelianus Harms in *Notizbl. bot. Gard. Mus. Berl.* **10** : 276 (1928). Type: Papua New Guinea, New Ireland, Lamekot, June 1927, *Peekel* 1090 (B ?†, holo).

[*A. caesifolia* Elmer, *Leafl. Philip. Bot.* 9 : 3321 (1937), *nom. non rite publ.* (*descr. angl.*).]

C. rhytidocalyx Airy Shaw in *Bull. Misc. Inf. Kew* **1940** : 256 (1940). Type: Malaysia, Sarawak, 4th Divn, Mt Dulit, Dulit Trail, *c.* 400 m, 26 Aug. 1932, *Richards* 1460 (K!, holo; SING!).

C. doctersii Harms in *Engl., Bot. Jahrb.* **72** : 181 (1942). Type: Indonesia, Irian Jaya, Djajapura, Rouffaer River, 175 m, Aug. 1926, *Docters van Leeuwen* 9927 (B ?†, holo; A, K!, L!).

C. pachycalyx Harms, *op. cit.* : 186 (1942). Type: Papua New Guinea, East Sepik, 'hauptlager Malu', 1912, *Ledermann* 6707 (B ?†, holo; B!).

*Since going to press, *de Wilde et al.* 16513 (L!) from Atjeh, *c.* 35 km N.W. of Kutatjane has been seen, "Tree 15 m, d.b.h. *c.* 25 cm, wood creamy, milky sap from cambium region. Fls . . . greyish green to dirty yellowish-brown, anthers creamy. Fls *c.* 2·5 cm long, ± fragrant".

Tree to 30 m; d.b.h. to 40 cm. *Trunk* with buttresses to 3 m high and 2 m out; *bark* dippled, lenticellate, dark brown, tardily white-laticiferous; *inner bark* dark red-brown; *sapwood* yellow. *Twigs* 4–12(–20) mm diam., cicatrices conspicuous. *Leaves* in terminal spirals on drooping branches, casting dense shade, to 1·5 m long, pseudogemmulate; *rachis* 2·5–6·0(–11) mm thick, terete to angled; *leaflets* in up to 17 pairs, petiolule (3–)6–13 mm long, lamina (4–)10–38 cm long and (2·7–)5·5–14·5 cm wide, ovate to oblong, dull midgreen adaxially, paler abaxially, reddish when expanding, inconspicuously adpressed hairy notably on abaxial surface of veins, midrib strongly sunken adaxially, costae 10–15 on each side. *Inflorescence* to 65 cm long, 2–3-branched fragrant; *branches* to 45 cm long, ± ascendant; *pedicels* short, pseudopedicels 2·5–3·5 mm long; *calyx* 2·0–5·5 mm tall, shallowly cupular to cylindrical, sometimes thickened annularly, obscurely 5-lobed to truncate; *petals* (4–)5(–6), 13–19 mm long, 2–3 mm wide, pinkish, valvate; *staminal tube* *c.* 11 mm tall, (4–)5(–8)-lobed, sericeous except basally and apically, occasionally subglabrous without, lobes to 4 mm long, ± truncate; *anthers* (4–)5–6(–9), 2·8–3·8 mm long, locellate; *ovary* 2–3-locular; *style* 8–10 mm long, densely pubescent except near cylindrical stigma. *Infructescence* to 45 cm long, pendent, of subglobose fruits to 4·5 cm wide, 3·2 cm long, velutinous, fleshy orange to bright red, stipe to 1·5 cm long, pericarp thick, spongy with 2 strong and 2 weak sutures, latex white to colourless; *seeds* 1–2, shining pale orange, sarcotesta perforated with 1·5 mm hole near micropyle, cotyledons collateral.

Vietnam, Thailand and Malesia east to the Bismarck Archipelago, 0–700 m, in primary and secondary forest and as a relic in hedgerows, etc.

Thailand. Peninsular, Yala, Banaang Sata, *Sangkhachand* 1390 (K!, P!). Indonesia. Sumatra, Asahan, Mosihi For. Res., *Krukoff* 4214 (A!, L!, LE!, SING!); West, Mt Sago, 800 m, *Meijer* 5793A (L!); Simalur Is., *Achmad* 265 (L!); Java, Pasuruan, *Koorders* 38283*β* (K!) & Pangrango, *Junghuhn* '127' (L!); Kalimantan, SE, Berouw, bb 19220 (A!); G. Sekrat, S. of Sangkulirang, *Kostermans* 6225 (A!) & C. Kutei, nr Tabang K., *Kostermans* 10588A (K!); Moluccas, Morotai, Tobelo, N. Totodoku, *Tangkilisah* 43 (K!, L!); Buru, Bal Balo bb 25173 (A!), & Seram, Kairata, *Kuswata & Soepadmo* 41 (A!, K!, L!, SING!); Irian Jaya, Geelvink Bay, Nabire, *Kanehira & Hatusima* 11499 (A!) & Vogelkop, BW 314 (L!, LAE!) & Djajapura, BW 786 (K!, L!, LAE!) & Fakfak, BW 10000 (L!). Malaysia. Kedah, Gg. Jerai, 100 m, *Pennington* 7853 (FHO!); Kelantan, 1 mile E from K. Yai, 1200 m, FRI 4174 (A!); Perak, Larut, *King's Coll.* 3235 (A!); Pahang, Krau Game Res., 300 m, FRI 3587 (A!, K!); Selangor, mile 17, Ulu Gombak, *Nur* SFN 34231 (SING!); Sarawak, Beram 200 m, *Anderson* 4084 (A!, K!, SAN!, SAR!); 1st Divn, Santubong, 300 m, *Mabberley* 1624 (FHO!, SAR!); Kapit, *Anderson & Pa'ie* S 28269 (SAR!); Sabah, Lahad Datu, Kretam, *Wood* SAN A 4824 (A!, K!, SING!); Sandakan, Sepilok *Pennington* 7917 (FHO!, SAN!) & Beaufort, *Mikil* SAN 32026 (SAN!). Brunei. Above K. Empau, BRUN 5221 (KEP!, SAR!). Philippines. Luzon, Cagaya Prov., nr Penablanca, *Adduru* 77 (K!) & Isabela, San Mariano, Sierra Madré Mts, *Gutierrez* PNH 78075 (A!); Sorsogon, Mt Juban, *Edaño* PNH 37096 (K!) & Mt Bulusan, *Elmer* 16698 (A!, BM!, BP!, G!, K!, U!). Leyte, *Wenzel* 311 (A!). Samar, *Ramos* BS 1708 (A!, BM! SING!). Mindoro, Pinamalayan, *Ramos* BS 40860 (A!, K!) & Bongabong River, *Merritt* FB 3664 (K!). Mindanao, Davao, Mt Apo, *Elmer* 11618 (A!, BM!, BP!, G!, K!, L!, U!) & Zamboanga, Sax R., *Williams* 232G (K!). Papua New Guinea. West Sepik, NGF 13259 (K!, LAE!); East Sepik, *Hoogland & Craven* 10161 (LAE!); Madang, Gogol, *Mabberley* 1748 (FHO!, LAE!); Morobe, Tamiloa, 6 miles W of Lae, *Mabberley* 1720 (FHO!, LAE!); Southern Highlands, *Schiefflin* 9 (LAE!); Gulf, NGF 8045 (K!, LAE!); Central, *Pullen* 8119 (LAE!); Northern, *Saunders* 59 (LAE!); Milne Bay, *Brass* 24035 (K!, LAE!); New Britain, *Pennington* 8104 (FHO!, LAE!).

Stevens (1975 : 10) noted that *Chisocheton ceramicus* occurs in Borneo and the Philippines as well as in Java, the Moluccas and New Guinea. The description and type material of *C. clementis* from the Philippines fall within the range of *C. ceramicus* from those areas. I have also reduced to synonymy *C. junghuhnii*, *C. macrothyrsus* and *C. rhytidocalyx* from Sumatra, Malay Peninsula and Sarawak respectively. Type material of *C. junghuhnii*, included by Stevens in *C. ceramicus* (*op. cit.* : 11), has flowers borne on inflorescences in the axils of unexpanded leaves. Otherwise it compares well with *C. ceramicus* from Java; *C. macrothyrsus*, according to the material available to Stevens (*op. cit.* : 10), differs in its larger flowers and accrescent calyx in fruit. Not all specimens from the Malay Peninsula have such a calyx and large flowers are to be found in material from the Philippines. Type material of *C. macrothyrsus* does not have the large calyx whereas *Pennington* 8104 (FHO!) in L! and LAE! from New Guinea does have. The number of stamens in some speci-

mens from the Malay Peninsula and from Sumatra is often higher than the norm for the species, e.g. *Lörzing* 12785 (A!, K!, L!) from northern Sumatra. This character also distinguishes the type of *C. rhytidocalyx*. In view of the range of intermediates to be found in the Malay Peninsula, I cannot see the value of upholding the latter species either. None of the features of extreme forms of the species is connected clearly with any geographical or ecological replacement and therefore I have refrained from creating or considering any infraspecific taxa.

The repeated new descriptions of Philippine material, clearly identical with *Chisocheton clementis*, in *Amoora* (i.e. *Aglaia*) by Merrill is not easily explained.

Chisocheton globosus is known to me only from the type collection which is extremely meagre. It is possible that it refers to *C. dysoxylifolius* and is thus included here with caution.

40. Chisocheton curranii Merr.

In *Philip. J. Sci.* **3** : 234 (1908) & *Enum. Philip. Fl. Pl.* **2** : 367 (1923). Types: Philippines, Luzon, Benguet, Baguio, Aug. 1906, *Curran* FB 4865 (PNH?†; K!, isosyn (photo at FHO!)) & 4923 (PNH?†).

Tree about 5 m high. *Twigs* fawn pubescent. *Leaves c.* 20 cm long; *rachis*, petiolules midribs and costae densely fawn pubescent; *leaflets* 8–11 cm long, 3·0–4·5 cm wide, elliptic, subcoriaceous, in up to 3 pairs, apex shortly acuminate, base acute, costae about 7 on each side, venation prominent; *petiolules* 5·0–7·0 mm long. *Inflorescence* (*fide* Merrill) to 15 cm long, paniculate; *branches* to 2 cm long, spreading or ascending pubescent; *calyx* 4–5 mm tall, cupulate, pubescent, margin subentire to obscurely lobed; *petals* 5, to 16 mm long, 2 mm wide, pubescent without, yellowish white; *staminal tube* to 14 mm long, appressed hairy on both sides, 5-lobed, lobes 2·5 mm long, obtuse; *anthers* 5, 2·5 mm long; *ovary* 2-celled, hirsute; *style c.* 10 mm long, hirsute. *Fruit* (*fide* Merrill) globose to 6 cm diam., brown; *seeds* to 3 cm long.

Known only from the types.

PHILIPPINES. Luzon, *Curran* FB 4865 (K!, type).

This species is known to me only from Merrill's description and the meagre isosyntype, which I hesitated to dissect. In many respects the plant has similarities to both *Chisocheton ceramicus* and *C. pentandrus*, for example the fruit of the former and the inflorescence of the latter. Although *C. curranii* may be based on a mixed gathering, it seems unlikely to be an hybrid between the two above-mentioned species, as it differs from both in the nature of its indumentum.

41. Chisocheton pentandrus (Blanco) Merr.

In *Philipp. Gov. Lab. Bur. Bull.* **27** : 31 (1905) & *Spec. Blanc.* : 210 (1918); West & Brown in *Bull. Phil. Is. Dep. Agr. Bur. For.* **20** : 119 (1920) and *op. cit.*, **22** : 121 (1921); Merr., *Enum. Phil. Fl. Pl.* **2** : 367 (1923) & in *Philip. J. Sci.* **29** : 378 (1926); Elmer, *Leafl. Phil. Bot.* **9** : 3347 (1937); Harms in *Fedde, Rep.* **42** : 7 (1937) & in Engl. & Prantl, *Pflanzenfam.* 19b1 : t. 33 (1940); Meijer in *Bot. News Bull. Sabah* **8** : 78 (1967). Fig. 8.

Trichilia pentandra Blanco, *Fl. Filip.* : 355 (1837) & ed. **2** : 249 (1845); Roem., *Hesperid.* : 115 (1846); C. DC. in DC., *Monog. Phan.* **1** : 749 (1878). Type: I designate Merrill's 'illustrative specimens' mounted on the same sheet (*Sp. blancoanae* no. 6) as neosyntypes: Philippines, Luzon, Mt Maquiling, Nov. 1912 (flowers) and March 1913 (fruit) (BM!), neosyn.

Dasycoleum philippinum Turcz. in *Bull. Soc. Nat. Mosc.* **31** : 415 (1858); C. DC., *op. cit.* : 540 & t. VII, 8 (1878); Vidal, *Sin. Fam. & Gen. Pl. Filip. Atlas* : t. 29C (1883) & *Pl. Vasc. Filip.* : 84 (1886). Type: Philippines, Luzon, Tayabas, 1841, *Cuming* 683 (CW, holo; BM!, G!, K!, L!, LE!, OXF!).

[*C. ceramicus* sensu F. Vill., *Novis. App.* : 42 (1880), *non* C. DC.]

C. sp., Vidal, *op. cit.*: 82 (1886).

C. microcarpus Koord. & Valeton in *Meded. Lands Plant.* **16** : 115 (1896); Backer, *Schoolfl. Java*: 209 (1911); Koord., *Exc. Fl. Java* **2**: 443 (1912); Koord.-Schum., *Syst. Verz.* 1 Abt. **1** (140): 28 (1912); Backer & Bakh., *Fl. Java* **2** : 125 (1965). Type: sheets in Koorders's herb. (BO); duplicates at L with inscription, 'De hoc specimine agitur in libro . . .', *viz.*: Java, 'Besoeki, Tjoermanis', *Koorders* 21872*β* (K!, L!) & 'Batavia, Tjiampea', *Koorders* 31350*β* (K!, L!) may be good candidates as isotopes.

C. philippinus (Turcz.) Harms in Engl. & Prantl, *Pflanzenfam.* III, **4** : 296 (1896); Perkins, *Fragm. Fl. Philip.* : 32 (1904); Briquet in *Mém. Inst. Nat. Genev.* **24** : 67 (1935).

C. microcarpus var. *moluccanus* Valeton in Hochr., *Pl. Bogor* **69** n. 146 (1904); Briquet, *op. cit.* : 65 (1935, '*macrocarpus*'). Type: Indonesia, Sulawesi, Menado, *Pelenkahn s.n.* (BO?, holo; CALC!, G!, K!, L!).

Chisochiton sp., Merr. in *Philip. J. Sci. Bot.* **11** : 280 (1916).
Chisocheton parvifoliolus Merr. in *op. cit.*, **13** : 297 (1918) & *Enum. Phil. Fl. Pl.* **2** : 367 (1923). Type: Philippines, Luzon, Ilocos, Tineg, 300 m, 20 March 1913, *Paraiso* FB 25467 (PNH?†; K!).
[*C. sorsogonensis* Elmer ex Merr., *l.c.* (1923), *nom. in synon.*]
[*C. curranii sensu* Elmer, *op. cit.* : 3346 (1937), *non* Merr.]

Tree or *treelet* 3–18 m high; *bole* to 10 m sometimes slightly buttressed to 60 cm. *Bark* greenish grey; *inner bark* pale fawn or pinkish; *sapwood* pale cream. *Twigs* 2·5–6·0 mm diam., deciduously tawny pubescent to subglabrous. *Leaves* to 45 cm long; *rachis* terete, minutely pubescent; *petiolules* to 8 mm long; *leaflets* in up to 9 pairs, to 16·5(–26·5) cm long, to 6·0(–9·0) cm wide, elliptic- to ovate-oblong, dark green adaxially, paler abaxially, glabrous or sparsely pubescent on veins, apex acuminate to acutely cuspidate, base ± unequally acute or obtuse, costae 8–16 on each side. *Inflorescence* spiciform to paniculate, to 63 cm long, axillary to supra-axillary or borne in axils of unexpanded leaves; *rachis* finely velvety puberulous; *flowers* pedicellate, fragrant (Pennington) or odourless (Elmer, 1937); *calyx* cupular, margin entire to obscurely or irregularly lobed, *c.* 4 mm tall, ± sparsely puberulous without; *petals* (4–)5, 8–12(16) mm long, 2 mm wide, cream, densely fulvescent-hirsute without, valvate, apex acute; *staminal tube* white, 5-lobed, lobes laciniate, ± densely pilose within, rarely subglabrous, pubescent without; *anthers* 5(–6), 3 mm long, glabrous; *ovary* shortly stipitate, hirsute, 2-locular; *style* glabrous to pubescent. *Infructescence* to 30 cm long with fruit to 21 mm diam., globose or beaked, dull red with minutely rusty tomentose indumentum, pericarp with white latex; *seeds* 2, flattened, to 1·5 cm diam., sarcotestal.

Rain forest from Malay Peninsula and Sumatra to Philippines and Seram, to 1400 m.

Readily divisible into two subspecies, with overlapping populations in northern Borneo, here treated as a third subspecies.

Key to subspecies

Fruit spherical; inflorescence ± branched
  Inflorescence to 4-branched; flowers to 8 mm long, leaflet costae *c.* 16 on each side
    (a) subsp. **pentandrus**
  Inflorescence sparsely branched; flowers 8–16 mm long; leaflet costae *c.* 13 on each side
    (b) subsp. **medius**
Fruit conspicuously beaked; inflorescence + unbranched; flowers to 18 mm long; leaflet costae 8–12 on each side
  (c) subsp. **paucijugus**

(*a*) subsp. **pentandrus**
(Fig. 8.3) *C. pentandrus s. str.*, see synonymy above.

Tree to 16 m high. *Twigs* 4·0–6·0 mm diam. *Leaflets* elliptic-oblong, base unequally obtuse or acute, costae *c.* 16 on each side. *Inflorescence* paniculate, 3–4-branches; *branches* to 12 cm long; *petals* to 8 mm long. *Fruit* to 21 mm diam., spherical with abrupt stipe to 8 mm long, 3 mm diam., and minute beak.

Drier forests of Malesia: Philippines, north-eastern Borneo, Sulawesi, Moluccas, Lesser Sunda Is., Java & Johore.

Indonesia. Java, Kediri, Gadrengau, *Koorders* 22680*β* (FHO!) & Pekalongan Subah, *Koorders* 13564*β* (K!); Bali, N. of Tabanau, Mt Bakukaru, 1000 m, *Wirawan* 448 (A!, K!, L!, LAE!); Sumbawa, Mt Balmante, 1000 m, *Kostermans* 18318 (A!, K!, L!); W. Flores, 300 m, *Kostermans & Wirawan* 202 (K!, L!); Kalimantan, E. Kutei, Sangkulirang Is., 30 m, *Kostermans* 4892 (BM!, K!); Sulawesi, Pangkadjene, *Teijsmann* 11734 (K!, L!) & Menado, Klabat, 340 m, bb 13502 (L!); Halmahera, Galela, *Beguin* 1900 (L!) Ambon, *Robinson* 1995 (K!). Malaysia. Johore, Jason Bay, Sg Rhu Rebu, *Corner* SFN 28496 (BM!,; K!, SING!); Sabah, Kinabalu, Ranau Rd, mile 43, *Pennington* 7930 (FHO!) & Tawau, Tinagat F.R., 45 m, *Talip & Nordin* SAN 48968 (K!, SAN!) & Semporna, Pababag F.R., 30 m, *Binson & Arto* SAN 63819 (K!, SAN!) & Kudat, *Ampuria* SAN 40389 (K!) & Lahad Datu, Palabag Is., *Harvey* SAN A 128 (K!) & Banggi Is., *Castro & Melegrito* 1612 (BM!). Philippines. Luzon, Montalban, *Vidal* 704[h] (A!) & Cagayan, nr Penablanca, *Adduru* 17 (K!) & Laguna, Mt Maquiling, *Elmer* 17552 (A!, BM!, K!, U!) & Marinduque, *Vidal* 1340 (K!) & Sorsogon, Mt Bulusan, *Elmer* 15857 (A!, BM!, K!, U!) & Baler, *Merrill Bur. Agric.* 1032 (K!) & Ticao Is., *Vidal* 2311 (K!) & Ilocos Norte, Mt Quebranda, *Edaño* PNH 17843 (A!, SING); Benguet, Baguio, *Elmer* 8828 (E!, G!); Mindoro, Paluan, *Ramos* BS 39742 A, *pp* [part fr.=

Fig. 8 *Chisocheton pentandrus* (Blanco) Merr. 1, subsp. *paucijugus* (Miq.) Mabberley from *Pennington* 7987; 2, subsp. *medius* Mabberley from SAN 76651; 3, subsp. *pentandrus* from *Pennington* 7930.

Dysoxylum sp.]!, BM!) & Bongabong, *Whitford* 1415 (BM!); Camiguin Is., *Fénix* BS 4046 (SING!); Leyte, *Wenzel* 65 (A!, E!); Basilan, *Miranda* FB 18965 (BM!); Negros, Oriental, Cuerno Mts, *Elmer* 10379 (A!, E!, K!, LE!); Mindanao, Davao, Quinoroan River, *Edaño* PNH 11425 (A!, SING!) & Lanao, *Cruz* FB 23880 (A!) & Surigao, Lake Mainit, *Ramos & Gonvocar* BS 83392 (A!, SING!).

I have added *Chisocheton parvifoliolus* to Harms's (1937) synonymy: it is merely a specimen with small leaflets from Luzon, where plenty of intermediates have been collected.

(*b*) subsp. **medius** Mabberley, **subsp. nov.**
(Fig. 8.2) [*C. beccarianus sensu* Merr., *Pl. Elm. Born.* (*Univ. Calif. Publ. Bot.* **15**) : 122 (1929); Heine in *Mitt. Bot. Staats. Münch.* **6** : 218 (1953); Meijer in *Bot. News Bull. Sabah* **8** : 78 (1967), *non* Harms (1896).]

A. subsp. *pentandro* fructu majore, floribus majoribus et a subsp. *paucijugo* fructu globoso differt.

TYPE: Malaysia, Sabah, Sandakan, Sepilok Forest Reserve, Jalan Kantor Pos, behind 'Post Office', 9 May 1974, *Mabberley* 1676 (FHO!, holo; K!, iso).

Small tree to *c.* 8 m. *Twigs c.* 4·0 mm diam. *Leaves* to 32·5 cm long; *leaflets* in *c.* 4 pairs, base cuneate, apex long-acuminate (acumen *c.* 15 mm), costae *c.* 13 on each side, petiolule to 5 mm long. *Inflorescences* to 30 cm long, weakly branched, proximal branches to 6 cm long. *Fruit* globose.

Palawan (Philippines) and northern Borneo.

PHILIPPINES. Palawan, Puerto Princera, Babayan, *Edaño* PNH 94 (A!). INDONESIA. Kalimantan, S. of Sangkulirang, G. Sekrat, *Kostermans* 6224 (K!). MALAYSIA. Sabah, Sandakan, *Mabberley* 1676 (FHO!, K!, type) & Lahad Datu, ± 800 m, $3\frac{3}{4}$ miles, Silau road, *Sinanggul* SAN 57318 (SAN!) & Tawau, 15 miles, Apas road, *Gibot* SAN 30006 (K!, SAN!) & Ranau, 900 m. Bt Tampurango, *Singh* SAN 24160 (SAN!) & Mt Kinabalu, *Clemens* 10164 (A!).

In the absence of fruits, it is difficult to assign some specimens. Such gatherings could represent either of the other two subspecies.

(*c*) subsp. **paucijugus** (Miq.) Mabberley, **comb. & stat. nov.**

(Fig. 8.1) *Schizochiton paucijugum* Miq., *Ann. Mus. Bot. Lugd. Bat.* **4** : 27, 30 (1868). Types: Indonesia, Sumatra, W., Mt Singalaang, *Korthals s.n.* (L!; U!, syn) & Kalimantan, S. Mt Sakoembang & nr River Poenay, *Korthals s.n.* (L!; U!, syn).

Dasycoleum beccarianum Baillon in *Adansonia* **11** : 263 (1874); C. DC. in DC., *Monog. Phan.* **1** : 540 (1878). Type: Malaysia, 'Sarawak 1865–8', *Beccari* 1845 (FL, G!, K!, LE!, *P*).

C. spicatus Hiern in Hook. f., *Fl. Br. India* **1** : 550 (1875); C. DC., *op. cit.* : 535 (1878); Curtis in *J. As. Soc. Str. Br.* **25** : 22 (1894); King in *J. As. Soc. Bengal* **64** (2) : 26 (1895); Merr. in *J. As. Soc. Str. Br.*, spec. no. : 319 (1921); Ridley, *Fl. Malay Penin.* **1** : 387 (1922); Corner, *Life of Plants*, t. 42 (1964) & *Seeds Dicots.* **2** : t. 375c (1976). Type: Malaysia, Malacca, *Maingay* '363' (K!, holo; A!, CGE!).

C. paucijugus (Miq.) B. D. Jackson, *Ind. Kew.* **1** : 517 (1895); Merr., *l.c.* (1921).

C. beccarianus (Baillon) Harms in Engl. & Prantl. *Pflanzenfam.* III, **4** : 296 (1896).

C. sp., Merr. in *Univ. Calif. Publ. Bot.* **15** : 122 (1929).

Small *tree* to 8 m high. *Twigs* 2·5–3·0 mm diam. *Leaves* to 45 cm; *leaflets* in 3–5(–6) pairs, ovate-oblong, base cuneate, apex acutely cuspidate, costae *c.* 8–12 on each side, petiolules 6–8 mm long. *Inflorescence* to 24 cm, usually unbranched, bearing cymules of 1–few flowers; *petals* to 18 mm long. *Infructescence* with fruits borne at tip, tapering at each end, the distal acute, proximal terete.

Wetter forests of western Malesia from Sumatra and Malay Peninsula to Borneo and southern Philippines.

INDONESIA. Sumatra, N., Padang Sidempnan, *Kostermans* 22001 (L!) & Asahan, Kuala Masihi, *Yates* 2396 (B!); Kalimantan, 1°50′ S, 115°40′ E, 240 m, *Vogel* 802 (L!) & Sangkulirang Distr., Mt Dedadam, *Kostermans* 13460 (L!). MALAYSIA. Penang, *Kiah* SFN 35345 (KEP!, SING!); Perak, *Burn Murdoch* 201 (SING!); Pahang, Taman Negara, *Whitmore* FRI 15310 (K!, KEP!); Malacca, *Alvins* 1989 (SING!); Johore, Labis, *Whitmore* FRI 15620 (KEP!); Sarawak, Kuching, *Ghazalli* S13402 (SAR!) & Baram, *Chew* CWL 480 (SAR!) & Miri, *Othman* S21346 (A!, FHO!, L!, SAN!, SAR!) & Marudi, *Sibat* S22806 (L!, SAN!, SAR!) & 5th Divn, *Chai & Ilias* S31541 (FHO!, SAR!); Sabah, Tawau, *Brand* SAN 21484 (SAR!) & Sandakan – Sepilok, *Singh* SAN 22542 (SAR!) & Lungmanis *Putan* SAN 46682 (SAN!) & Beaufort, BNB 3215 (K!). SINGAPORE. *Ridley s.n.* (SING!). PHILIPPINES. Palawan, Iwahig, Lapulapu River, *Edaño* PNH 143 (A!, L!).

The type of *Dasycoleum beccarianum* is a good match for other Bornean material identical with the types of *Schizochiton paucijugum*.

42. Chisocheton pellegrinianus Mabberley, **sp. nov.**

(Fig. 9) A *C. erythrocarpo* Hiern ramuli ubi siccati nigelli, nervis secundariis pluribus, floribus parvis, disco annulare differt.

[*C. glomeratus sensu* Pellegrin in Humbert, *Suppl. Fl. Gén. Indochine* (5) : 692 (1946), *non* Hiern (1875), i.e. *C. patens* B1.]

[*C. erythrocarpus sensu* Pellegrin, *op. cit.* : 695 (1946), *non* Hiern (1875)].

Arbor ad 10–12 m altus. *Ramuli* foliati circa 5·0–6·0 mm diam., velutino-fulvi ubi juventes, nigelli ubi siccati. *Folia* 30–45 cm longa, pseudogemmulata, foliolis usque ad 8-jugis; *petiolus* circa 7 cm longus, pubescens; *foliola* usque ad 15 cm × 6 cm, elliptico-oblonga, praeter costam adaxiale glabra, abaxiale pubescentia, apice cuspidato, base parum asymmetrica, cuneata subcordatave, petiolulo 3–4 mm longo, pubescente, nervis secundariis circa 11 utrinque, abaxiale prominentibus, nervatura tertiaria conspicua. Inflorescentia circa 27 cm longa, supra-axillaris, pendens, dense pubescens; *rami* ad 3·5 cm longi, plus minusve squarrosi floribus glomeratis; *bracteae* lanceolatae,

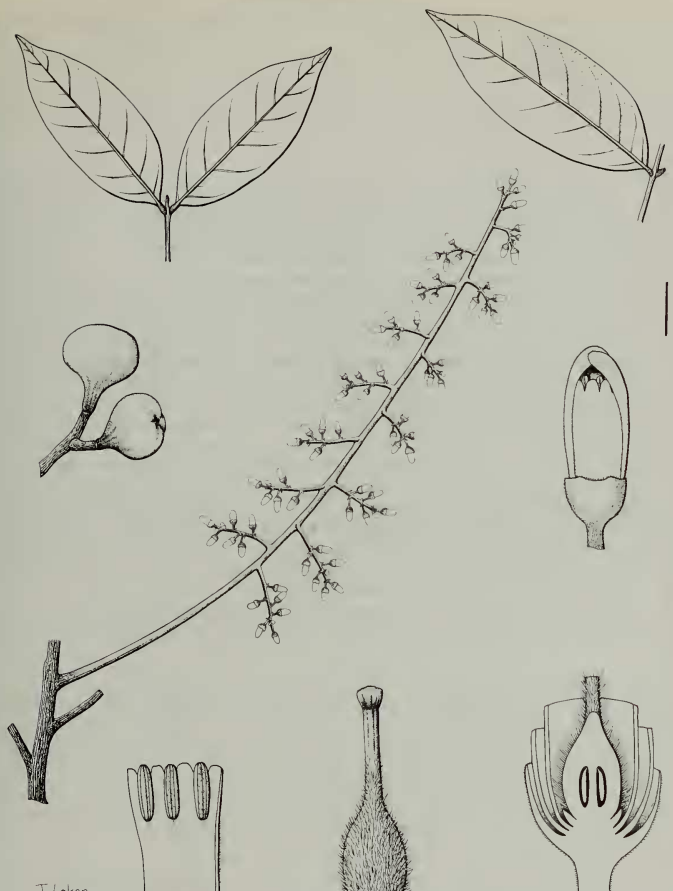

Fig. 9 *Chisocheton pellegrinianus* Mabberley. Leaf apex and fruit from *Poilane* 8429 (scale = 2 cm), inflorescence (scale = 2 cm), flower (scale = 2·5 mm), half flower base, pistil and part tube (scale = 1·25 mm) from *Evrard* 766.

pusillissimae; *calyx* 2·5–3·0 mm longus, cylindricus, pubescens, margine integra vel parum 3–4-dentata; *petala* 5, 8 mm longa, elliptico-oblonga, concava, extus velutina; *tubus staminalis* 6–8-lobatus, intus glaber, extus velutinus, lobatis obtusis, glabris; *antherae* 2·5 mm longae, oblongae, locellatae, parum exsertae; *discus* annularis; *ovarium* pubescens, bilocularis; *stylus* dimidio distale glaber, stigma cylindrica mammilla centrale praedita. *Fructus* 2·5–4·0 cm longus, 2·0–2·5 cm diam., pyriformis, fulvo-pubescens; *semina* 2.

Type: Vietnam, Xa-cam nr Honquam, 60 km from Thu-Dan-Mot (11°0′ N, 106°37′ E), 15 April 1922, *Evrard* 766 (P!, holo (photo at FHO!)).

Other material: km25 Nha Trang to Ninh Hoa, 100 m, 26 Oct. 1923, *Poilane* 8429 (P! (photo at FHO!)).

The specific name commemorates François Pellegrin (1881–1965), student of Indochinese Meliaceae (*Taxon* **14** : 249–250).

43. Chisocheton erythrocarpus Hiern

In Hook. f., *Fl. Br. Ind.* **1** : 550 (1875); C. DC., *Monog. Phan.* **1** : 534 (1878); King in *J. As. Soc. Bengal* **64** : 31 (1895); Ridley in *J. As. Soc. Str. Br.* **33** : 59 (1900) & *Fl. Malay Penin.* **1** : 388 (1922). Type: Malaysia, Malacca, *Maingay* '322' (21 Aug. 1865/6, 1379 (K!) & 1867–8, 2525 (K!, L!)).

Small-crowned tree to 25 m; *bole* diam. to 25 cm. *Buttresses* to 1 m long and tall and 10 cm thick. *Bark* smooth to cracking, dark grey to chocolate brown; *inner bark* reddish brown; *wood* cream. *Twigs* rough, dark brown. *Leafy twigs* 4–5 mm diam., densely and minutely rusty tomentose. *Leaves* pseudogemmulate to 36 cm long; *leaflets* in up to 6 pairs, to 10 cm long, 8 cm wide, elliptic oblong to broadly ovate, shortly abruptly and bluntly acuminate, cuneate or rounded at the slightly asymmetric base, chartaceous, adaxial surface glabrous except the puberulous midrib, abaxial softly and shortly rusty-pubescent, costae 6–8 on each side of midrib, somewhat arcuate; *petiolule* to 1 cm. *Inflorescence* to 14 cm long, paniculate, in upper axils of shoots, supra-axillary, minutely rusty-tomentose; *lateral branches* short, horizontal, cymose; *pedicels* short; *calyx c.* 4 mm long, cylindric, margin truncate to praemorse, densely tomentose without, glabrous within; *petals* 5–6, 9–13 mm long, 3–3·5 mm wide, narrowly boat-shaped, creamy-white, valvate, separating on drying, fleshy, adpressed sericeous without, glabrous within; *staminal tube* a little shorter than petals with 5–6 blunt, weakly lobed teeth *c.* 2·5 mm long, sericeous without except for narrow band at base and lobes, pubescent similarly within; *anthers* subsessile, basifixed at notch of lobes, *c.* 3 mm long, locellate; *pistil* minutely pubescent except for narrow band below cylindrical stylehead with glabrous apical mammilla. *Fruit* globose, peach-like to 6 cm diam., with minute beak, 2-locular, dehiscent, minutely tomentose, yellow when immature, blood-red when ripe, with white latex; *seeds* 2, *c.* 2·5 cm long, somewhat flattened, with thick orange-red sarcotesta.

Primary and secondary forests of the coastal regions of the Malay Peninsula and northern Borneo.

Indonesia. Kalimantan, Sebatik Is., 10 m, *Kostermans* 9141 (A!, K!, L!, SING!). Malaysia. Kedah, Kuala Muda, Sungkap F.R., 60 m, *Wyatt-Smith* KEP 71153 (KEP!); Pahang, Temerloh, Jenka F.R., *Kochummen* KEP 98578 (K!, KEP!, SAN!, SING!); Selangor, Sg. Buloh, *Hardial & Sidek* 452 (K!); Trengannu, K. Dungun, *Soepadmo & Mahmud* 9125 (A!); Negri Sembilan, Sg Menyala, ± sea-level, *Pennington* 7861 (FHO!, KEP!, SING!); Sabah, Jesselton, Sipanggar Is., 30 m, *Ampuria* SAN 41320 (K!, L!, SAN!, SAR!) & Sandakan, Kabun China F.R., 90 m, *Sinanggul* SAN 38379 (K!, SAN!) & Kudat, Temalang F.R., *Meijer* SAN 19923 (K!, SAN!) & Lahad Datu, base of Mt Silam, 100 m, *Tarmiji* SAN 73426 (SAN!). Singapore. Tampinis River, *Ridley* 5965 (K!, SING!); Pulau Ibai (?), *Ridley s.n.* (SING!). Brunei. Telamba, *Ashton* BRUN 5033 (K!, KEP!, SAR!, SING!).

(iv) sect. **Rhetinosperma** (Radlk.) Mabberley, **comb. & stat. nov.**

Rhetinosperma Radlk. (genus) in Engl. & Prantl. *Pflanzenfam. Ergänz.* II (3), **5** : 204 (1908). Type: *R. longistipitata* (F. M. Bailey) Radlk. = *Chisocheton longistipitatus* (F. M. Bailey) L. S. Smith.

Trees. Indumentum of stellate hairs. *Leaves* pseudogemmulate with pseudogemmula approaching condition of some *Dysoxylum* species. *Inflorescences* axillary to supra-axillary. *Flowers* with valvate(-imbricate) petals, separating on drying; *anthers* scarcely locellate; *disk* cupular. *Seeds* sarcotestal.

Four species. North-eastern Borneo eastwards to New Hebrides.

44. Chisocheton koordersii Mabberley, **nom. nov.**

C. kingii Koord. in *Meded. Lands Plant.* **19** : 385 & 636 (1898); Koord.-Schum., *Syst. Verz.* III Abt. **1** : 63 (1914); Koord., *Fl. N.U. Celebes*, suppl. 2 : t. 43 (1922). Types: Sulawesi, Minahasa, *Koorders* 17978*β* (Menado, 26 Jan. 1895; BO, L!), 17960*β* (50 m, 4 Feb. 1895; BO, K!, L!), 17973*β* (50 m, 6 Feb. 1895;

BO, L!), 17989β (700 m, 15 April 1895; BO, L!), 17964β (22 April 1895, BO, L!). *Non C. kingii* Harms (1896), i.e. *C. macrophyllus* King.

Tree to 30 m; *bole* to 14 m, diam. to 60 cm; *buttresses* to 1·5 m. *Bark* rather rough, finely fissured, brown, ½ mm thick; *living bark* 5 mm thick, yellow to white; *wood* white. *Twigs* (6–)8–12 mm thick, pith wide and hollow in herb. specimens, sometimes housing ants. *Young twigs*, petiole, rachis, pseudogemmula and leaflets, especially veins below minutely stellate (4-armed) pubescent, pseudogemmula rusty thus. *Leaves* to at least 35 cm long, pseudogemmulate; *petiole* to 18 cm, terete; *leaflets* to 25(–35) cm long, 10 cm wide, elliptic to suboblong, acuminate, base rounded, symmetrical, costae up to 17 on each side of midrib sunken in dried specimens. *Inflorescence* to 45 cm long, axillary, of ascendant branches to 18 cm long, forming 3-branched pyramidal panicle of creamy-white, scented, apparently bisexual, apparently ebracteate, sessile flowers with short 'pseudopedicel'; *calyx* tubular-urceolate, obscurely lobed, almost praemorse, 3·5–4·0 mm long, *c.* 2·5–3·0 mm across at apex, minutely stellate-pubescent without, glabrous within; *petals* 5–6, narrowly spathulate, valvate and connate below for lowermost ⅓–¾, densely, minutely stellate-pubescent without, glabrous within, 11–12 mm long; *staminal tube c.* 10 mm long, long-villous without in band below lobes, lobes *c.* 2·5 mm long, ± bilobed, glabrous, reflexed at anthesis, tube glabrous within except for band of small ascendant hairs just below anthers; *anthers* 5–6, *c.* 2–2·5 mm long, glabrous, alocellate, sessile, basifixed in angle of lobes, minutely pointed at apex; *disk* cupular, adnate to the ovary and half its height, glabrous; *ovary c.* 2·5 mm high, minutely pubescent; *style* glabrous except minutely pubescent in lower ½–⅓, capitate. *Fruit c.* 5 cm diam. (after Koorders).

Eastern Borneo and Sulawesi, 10–600 m.

INDONESIA. Kalimantan, E. Kutei, Sg Susuk Region, 20 m, 1 July 1951, *Kostermans* 5592 (A!, K!, L! LAE!, SING!); Sulawesi, Minahasa (Menado), 50 m, 4 Feb. 1895 *Koorders* 17960β (type); Menado Bolaang Mongodow Solog, 200 m, 12 April 1935, *Neth. Ind. For. Ser.* bb 19597 (A!). CULT. Bogor, 111 F8a, *Sutrisno* 45 (K!, LAE!, SING!). MALAYSIA. Sabah, Keningau, nr Laing Cave, Apin Apin, ± 600 m, 4 Aug. 1965, *Lajangah* SAN 44563 (K!, SAN!).

45. Chisocheton rex Mabberley, **sp. nov.**

(Fig. 10) A *C. koordersii* Mabberley foliis non acuminatis, nervis secundariis pluribus, ramis inflorescentiae tenuibus, floribus parvis sed calyco majore, differt.

Arbor ad 25 m altus, ambito 1·75 m. *Ramuli* foliati *c.* 11 mm diam., lenticellati, indumento stellato. *Folia* ad 52 cm longa, pseudogemmulata, foliolis usque ad 7-jugis; *rhachis* ubi siccata adaxiale canaliculata; *foliola* ad 21 cm × 6·5 cm, oblongo-ovata, praeter nervaturam abaxiale subglabra, apice non acuminata, base plus minusve rotundata, pseudogemmula dense pubescente, nervis secundariis circa 21 utrinque, fere marginem attingentibus. *Inflorescentia* (mascula solum cognita) ad 53 cm longa, axillis foliorum immaturorum orta, 2-ramosa, tenuis; *rami* ad 15 cm longi, circa 1 mm diam., gracillimi, dense pubescentes; *pedicelli* circa 5–8 mm longi, graciles, pubescentes; pseudopedicelli circa 1 mm × 1 mm, crassi; *calyx* circa 4 mm × 4 mm, cupulatus, pubescens, margine integro vel 6-lobato, prope pseudopedicellum rugoso; *petala* 5, 10 mm longa, anguste oblongo-elliptica, alba, valvata vel leviter imbricata, ubi siccata disjuncta, extus dense pubescentia, apice cucullata; *tubus staminalis* ad 8 mm longus, extus dimidio distale dense adpresse pubescens, intus praeter caespites sparsos infra antheras glaber, lobis 5, 1·5 mm longis, aliquantum praemorsis parum pubescentibus, praeditus; *antherae* 5, 1·5–2·0 mm longae, vix locellatae, glabrae, basifixatae; *discus* cupuliformis; *ovarium* ? bilocularis, pubescens; *stylus* distale glaber, stigma subcapitata mammilla apicale praedita. *Flores feminei* et *fructus* ignoti.

TYPE. New Hebrides, Espiritu Santo Is., N. coast of alluvial plain, E. of River Jordan, 5 March 1970, *Whitmore* 3032 (K!, holo (photo at FHO)).

LOCAL NAME. *Takavui* (Whitmore).

Known only from the type though this majestic tree is, according to Dr Whitmore, common on Espiritu Santo.

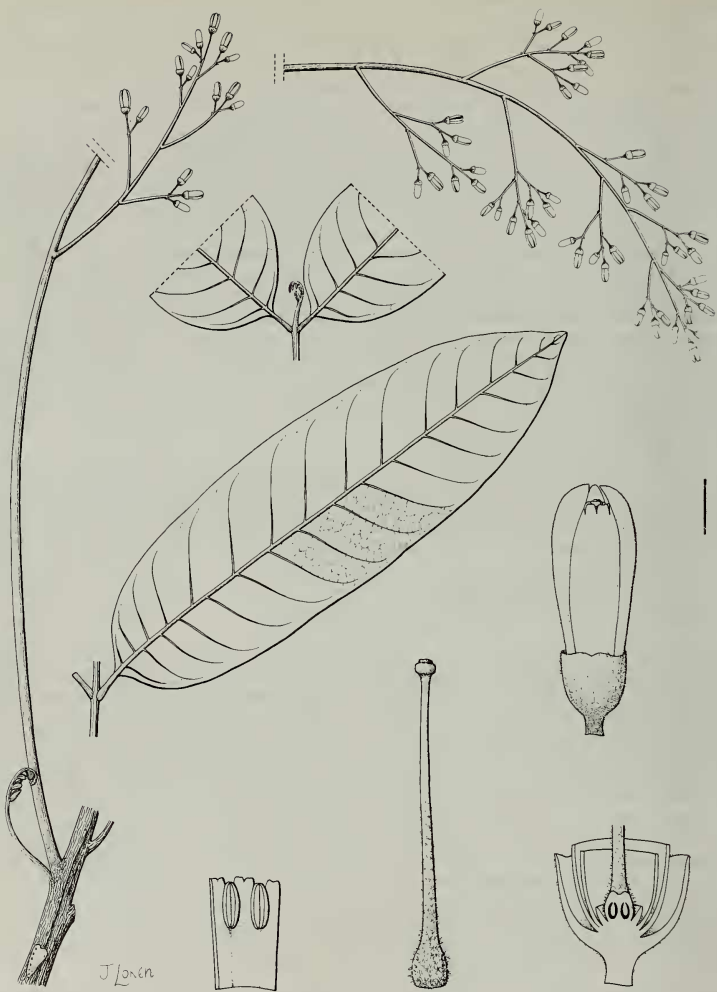

Fig. 10 *Chisocheton rex* Mabberley. From *Whitmore* 3032: leaf apex, lateral leaflet and inflorescence (scale = 2 cm), flower (scale = 2·5 mm) half flower base, pistil and part tube (scale = 1·25 mm).

46. Chisocheton stellatus P. F. Stevens
In *Contrib. Herb. Aust.* **11** : 43 & t. 6 (1975). Type: Papua New Guinea, Madang, Gogol logging area, 150 m, no. 1 ramp, 9 April 1970, *Wagapani* LAE 50004 (LAE!, holo; A, BRI, CANB, BO, K!, SING, NSW).

Tree to 30 m tall, to 60 cm d.b.h., buttressed to 1 m. *Bark* brown, flaky or not; *inner bark* brown to yellowish; *sapwood* white to straw. *Twigs c.* 6 mm across, stellate-velutinous. *Leaves* to 30 cm long, pseudogemmulate; *rachis* 3·0–4·5 mm across, petiolules 4–8 mm long; *leaflets* in up to 9 pairs, to 17 cm long and 8·5 cm wide, ovate to oblong, apex ± rounded, base rounded, stellate hairy on both surfaces, sometimes velutinous adaxially, midvein impressed adaxially, costae up to 18 on each side, venation prominulous abaxially. *Inflorescence* to 45 cm long, 1–2-branched; *branches* to 22·5 cm long, with congested cymules of flowers; *bracts* triangular, *c.* 1 mm long; *calyx* 1·3–1·7 mm long, densely pilose without, margin ± entire; *petals* 5(–6), 4·0–5·5 mm long, 0·7–1·0 mm wide, oblong-ligulate, white to yellow-green, densely pubescent without, valvate, separating from one another on drying; *staminal tube* (5–6)-lobed, lobes 1·0–1·2 mm long, retuse, pubescent without except at base and apex, within a little below anthers; *anthers* 5(–6), 0·8–1·0 mm long, scarcely locellate, connective pilose; *disk* crenulate, 0·4–0·8 mm tall, glabrous; *ovary* 2-locular, densely hairy; *style* ± glabrous, stylehead 0·4 mm diam. *Female flowers* and *fruits* unknown.

Northern New Guinea to 150 m.

Indonesia. Irian Jaya, Geelvink Bay, Nabire, 3 m, *Kanehira & Hatusima* 11478 (A!) & Djajapura, Res. Hollandia, Tami, *Brouwer* BW 804 (LAE!). Papua New Guinea. Madang, Gogol, LAE 50004 (type).

47. Chisocheton longistipitatus (F. M. Bailey) L. S. Smith
In *Proc. R. Soc. Queensl.* **70** : 29 (1959); Stevens in *Contrib. Herb. Aust.* **11** : 16 (1975); Johns, *Comm. For. Trees Papua New Guinea*, **5** : 217 (1976).
Castanospora longistipitata F. M. Bailey, *Queensl. Fl.* **1** : 288 (1899). Type: Australia, Queensland, Barron River (nr Cairns), 1895–99, *Cowley* 8D (BRI, holo).
Chisocheton polyanthus Harms in K. Schum. & Lauterb., *Fl. Schutzgeb.* : 383 (1901) & in *Engl., Bot. Jahrb.* **72** : 187 (1942). Type: Papua New Guinea, Morobe, Sattelberg, 12 Jan. 1899, *Bamler* 32 (B?†, holo).
Rhetinosperma longistipitata (F. M. Bailey) Radlk. in Engl. & Prantl, *Pflanzenfam.* II (3), **5** : 204 (1908).

Tree to 39 m tall; d.b.h. 75 cm; *buttresses* to 1·5 m. *Bark* dark brown, lenticellate; *inner bark* pale pink to yellowish; *sapwood* white. *Twigs* 4·0–8·0 mm diam., sometimes myrmecophilous, occasionally with milky latex. *Leaves* to 1 m long; *rachis* 2·0–4·5 mm diam. terete or channelled with short claw-like pseudogemmula; *leaflets* in up to 18 pairs, 9·0–32·0 cm long, 4·2–13·0 cm wide, elliptic-oblong, sparsely stellate-pubescent, midrib sunken, costae *c.* 18 on each side petiolules 4·0–8·0 mm. *Inflorescence* to 45cm long, 3–4-branched; *branches* to 10 cm long; *calyx* ± sessile, 1·5–3·0 mm tall, irregularly lobed to 1 mm; *petals* 4–5, 6–7 mm long, 0·4–0·7(–(1·0) mm wide; *staminal tube* 5-lobed, pubescent except at base and apex, lobes retuse, 1·4–1·8 mm long; *anthers* (4–)5, 0·8–1·3 mm long, scarcely locellate; *disk* cupular; *ovary* 2(–3, Stevens)-locular; *style* 3·5–4·0 mm long, stellate-pubescent except near apex, stylehead cylindrical with small mammilla. *Infructescence* to 30 cm, of reddish ± spherical fruit, 3·0–3·5 cm long, stipe 1·0–2·0 cm long, pericarp spongy; *seeds* 3, sarcotestal, with hole at micropyle, cotyledons collateral.

Papuasia and Queensland to 1065 m.

Indonesia. Irian Jaya, Djajapura, Bodem River, BW 8106 (LAE!) & Arfai, Manokwari, *Mangold* 147 (L! LAE! (BW 2218)). Papua New Guinea. West Sepik, Aitape, NGF 528 (LAE!); Madang, 5 miles SE Faita, *Saunders* 459 (LAE!); Morobe, Bulolo, NGF 7428 (A!, K!, LAE!); Northern, Isuarava, *c.* 1000 m, *Carr* 15887 (B!, BM!, SING!); Milne Bay, Raba Raba, NGF 34049 (L!, LAE!); Central, Abau, Cape Rodney, *Mabberley* 1793 (FHO!, K!, LAE!); New Britain, Hoskins, NGF 41464 (K!, LAE!); Bougainville, Mt Kamo, NGF 801 (L!, LAE!). Solomon Is. Choiseul, Wagina Is., BSIP 5447 (LAE!, SING!); Santa Isabel, Jejevo River, BSIP 7397 (K!, LAE!). Australia. Queensland Whitfield Range, *Volck & Hyland* 2122 (BRI, L!) & 17°05′ S, 145°40′ E, *Hyland* 7955 (K!) & N. Kennedy Dist., Mission beach, *Smith & Webb* 4920 (BRI, K!).

Species *non satis cognitae*

48. Species A (sect. *Chisocheton* ser. *Schumanniani*)

Tree to 4 m. *Leaves* small, with small leaflets. *Fruit* 3-locular, pink.

Papua New Guinea. Western Dist., Kiunga, *Ridsdale & Galore* NGF 33428 (LAE!) & 33466 (LAE!) & Ingembit, *Ridsdale & Galore* NGF 33348 (LAE!).

Known only in fruit, but apparently distinct from the rest of the species in the series.

49. Species B (sect. *Dasycoleum* ser. *Sandoricocarpi*)

Tree 20 m tall; d.b.h. 35 cm. *Bark* smooth, greyish, hoop-marked; *buttresses* to 1·3 m, 7·5 cm thick. *Leaves* to 70 cm; *leaflets* to 27 cm long, 8 cm wide, bluntly long-acuminate, velutinous abaxially, weakly pubescent on veins adaxially, costae *c.* 15 on each side. *Inflorescence* paniculate, supra-axillary, 70 cm long; *branches* to 22 cm, all brown long-tomentose; (*flowers* immature:) *calyx* irregularly lobed; *petals* 5; *anthers* 5, locellate; *disk* 0; *style* glabrous. *Fruit* 5 cm diam., red, velutinous; *seeds* 2.

Indonesia. Kalimantan, C. Kutei, *Kostermans* 10558A (L!, SING!) & Balikpapan, *Kostermans* 10024 (L!), 4175 (A!, SING!), 7383 (A!, K!, SING!). Malaysia. Sarawak, Kapit, S 25844 (K!, SAR!) & S 28793 (FHO!, K!, L!) & Miri, S 21307 (FHO!, K!, SING!).

N.B. The flowering specimen 10558A from Kalimantan seems referable here. The inflorescences are very short and some of the flowers are apparently galled or otherwise deformed. I refrain from giving this species a name until better flowering material is seen.

50. Species C (sect. *Dasycoleum* ser. *Sandoricocarpi*)

Two gatherings from Lahad Datu, Sabah, Malaysia, resemble *C. erythrocarpus* but the flowers are 4-merous, with a frilled calyx.

Malaysia. SAN 36018 (SAN!) & SAN 42241 (K!, SAN!).

51. Chisocheton warburgii Harms in *Fedde, Repert.* **42** : 9 (1937). Type: Indonesia, Sulawesi, N. Bojong, *Warburg* 15428 (B ?†).

The description of this tree resembles that of *Chisocheton* species B, but differs in having 8–9(–10?) anthers. It has some similarities with *C. cauliflorus* Merr. (*q.v.*) but I have seen no material that exactly matches Harms's long and excellent description.

N.B. Stevens (1975 : 18) notes that *Schodde* 2404 from the Southern Highlands of Papua New Guinea may well represent a new species allied to *C. longistipitatus* (F. M. Bailey) L. S. Smith (sect. *Rhetinosperma*), but differing from that species in its larger fruit with lignified pericarp.

List of specimens studied

As the specimens in the above enumeration represent records by degree square in the main, it seems worthwhile to list all specimens seen for this monograph, not only as identification aid, but as an indication of the material on which the species descriptions are based. The figures in parentheses indicate the species numbering in the above account. 2280 gatherings (3970 sheets) were examined.

Key: A = species A (48), aen = *C. aenigmaticus* (17), amab = *C. amabilis* (25), B = species B (49), C = species C (50), caul = *C. cauliflorus* (10), cel = *C. celebicus* (18), cer = *C. ceramicus* (39), cru = *C. crustularii* (6), cum = *C. cumingianus* (28), -bal = subsp. *balansae*, -kin = subsp. *kinabaluensis*), cur = *C. curranii* (40), div = *C. diversifolius* (35), dys = *C. dysoxylifolius* (27), ery = *C. erythrocarpus* (43), gli = *C. glirioides* (19), gra = *C. granatum* (31), grand = *C. grandiflorus* (36), ko = *C. koordersii* (44), lan = *C. lansiifolius* (30), lao = *C. laosensis* (21), lasioc = *C. lasiocarpus* (14, -car = *caroli*, -form = *formicarum*, -novog = *novoguineensis*, -pach = *pachyrhachis*, -schlec = *schlechteri*, -schum = *schumannii*, -tric = *trichocladus*, -vers = *versteegii*, -wein = *weinlandii*), lasiog = *C. lasiogy-*

nus (24), lon = *C. longistipitatus* (47), macra = *C. macranthus* (1), macro = *C. macrophyllus* (26, -fulv = subsp. *fulvescens*), med = *C. medusae* (2), men = *C. mendozai* (37), mont = *C. montanus* (12), novob = *C. novobritannicus* (11), pat = *C. patens* (29), pauc = *C. pauciflorus* (34), pell = *C. pellegrinianus* (42), pend = *C. penduliflorus* (5), pent = *C. pentandrus* (41, -med = subsp. *medius*, -pauc = subsp. *paucijugus*), per = *C. perakensis* (32), pil = *C. pilosus* (15), pohl = *C. pohlianus* (13), poly = *C. polyandrus* (4), rex = *C. rex* (45), rub = *C. ruber* (22), sap = *C. sapindinus* (20), sar = *C. sarawakanus* (23), saras = *C. sarasinorum* (33), say = *C. sayeri* (16), scho = *C. schoddei* (8), set = *C. setosus* (7), ste = *C. stellatus* (46), ten = *C. tenuis* (9), tom = *C. tomentosus* (3), vin = *C. vindictae* (38).

Achmad 117 (L) – aen, 265 (L) – cer, 642 (K, L) – aen, 673 (U) – pat, 681 (A, K, L) – aen, 947 (U) – pat, 1337 (K, U) – pat; *Adduru* 17 (K) – pent, 77 (K) – cer, 168 (K) – cer; *Alphonso et al.* S 195 (KEP, L) – pauc; *Alston* 14553 (BM) – lasiog, 15430 (BM) – lasioc-wein, 15575 (BM) – cum; *Alvins* 871 (SING) – pauc, 1163 (SING) – pend, 2004 (SING) – pat, 2011 (SING) – pend, *s.n.* (SING) – ery, *s.n.* (SING) – pat; *Anderson* 30 (E, K) – pat, 499 (K, SAR) – cer, 4084 (A, K, SAN, SAR) – cer, 4281 (K, SAN, SAR) – pent-pauc; *Ando et al.* 32 (KEP) – sar, 51 (KEP) – sar; *Anon. s.n.* (CALC, G, K, L) – pat; ANU 5562 (L, LAE) – mont, 9591 (LAE) – cum; *Atmodjo* 428 (L, FHO (photo)) – vin;

B... (CALC. herb. 79862–3) 8213 (CALC) – pat; *Balansa* 1489 (K) – cum-bal, 3697 (P) – cum-bal, 3701 (G, K, L, LE, P) – cum-bal; *Barnes* (Dec. Phil. : 239) (A, G) – pent; *Bates* 12159 (K) – cum-bal; *bb* 6644 (L) – pent, 12663 (L) – pent, 13502 (L) – pent, 14333 (K, L) – pent, 16168 (A) – macro, 17894 (A) – macro, 18526 (A) – ? cer, 18813 (A) – ? cer, 19208 (L) – ko, 19220 (A) – cer, 19221 (A) – cer, 19230 (L) – macra, 19239 (L) – macro, 19597 (A) – ko, 21323 (A) – ko, 22392 (A) – cer, ± 25173 (A) – cer, 25930 (L) – ? lao, 26246 (?) – pat, 30364 (L) – cum, 33431 (*Kostermans* 226) (K, SING) – cer; *bb Cel/V*-173 (L) – cum; *Beccari* 1845 (G, K, LE) – pent-pauc, 3186 (K) – sar; *Beguin* 551 (L) – cer, 1240 (L) – cum, 1900 (L) – pent, 2302 (K, L) – lao; *van Beusekom & Phengkhlai* 277 (E, K, L, P) – dys, 662 (E, K, L, P) – pat; *Biró* 18 (BP) – lasioc-wein/trich, 202 (BP) – lon; *Bistras* (?) 1577 (A) – cum-bal; *Blume s.n.* (G, L) – pat, *s.n.* (G, L. (FHO photo), U) – pat, *s.n.* (CALC, K, L) – pat, *s.n.* (K, L (FHO photo), U) – pat; *BNB* 3116 (FHO, K) – Ian, 3215 (K) – pent-pauc, 7705 (K, L, SING) – sar, 9950 (K, L, SING) – sar; *BNB FD* 3213 (FHO, K) – macra, 4561 (K, L) – med; *Boden Kloss* 19079 (SING) – poly; *Borden* 1656 (K) – pent, 1689 (BM, SING) – pent, *s.n.* (K) – pent; *Bp F* 341 (U) – pat, 1042 (L) – pat; *Branderhorst* 351 (K, L, U) – lasioc-wein; *Brandis* 720 (K) – dys; *Brass* 716 (A, SING (photo)) – say, 1080 (K, LAE) – lasioc-wein, 5367 (BM, K, L) – lasioc-novog, 5477 (SING (photo)) – say, 5561 (SING (photo)) – say, 7174 (A) – ? say, 8020 (BM) – lasioc-wein, 8127 (LAE) – lasioc-wein, 23624 (LAE) – say, 23849 (K, LAE) – lasioc-wein, 23998 (LAE) – lasioc-wein, 24035 (K, L, LAE) – cer, 25607 (A, K, LAE) – say; *Brooke* 10138 (G, L) – poly, 10157 (L) – poly; *Brown* 109 (A) – lasioc-wein; *BRUN* 349 (L, SAR) – poly, 5033 (K, KEP, L, SAR, SING) – ery, 5221 (KEP, SAR) – cer; *BS* 211 (SING) – pat, 950 (A) – pent-pauc, 1031 (U) – pent, 1077 (U) – pat, 1324 (A, BM, SING) – pent, 1708 (A, BM, SING) – cer, 1812 (BM, SING) – pent, 1898 (SING) – pent, 2649 (A) – pent-pauc, 4046 (SING) – pent, 12646 (BM, G, K,) – cum, 15427 (BM, SING) – pent, 15771 (G) – cum, 16429 (BM, K) – pent, 17537 (K) – pat, 17625 (K) – caul, 20426 (BM) – pat, 22157 (BM) – cum, 23848 (FHO) – pat, 24457 (A, BM, L) – caul, 24497 (BM, K, L, SING) – men, 24519 (K, FHO, photo) – caul, 27340 (A) – pat, 28188 (A) – pat, 28243 (BM) – cer, 29056 (A) – cum, 30001 (A, BM) pat, 30340 (BM, K) – cum, 30898 (SING) – pent, 33871 (BM) – pat, 33912 (A) – pent, 34367 (BM, SING) – cer, 34502 (BM) – pat, 34954 (K) – macra, 37000 (A, K) – pat, 39742 (A, *pp*, BM) – pent, 40860 (A, K) – cer, 41088 (A, G) – cer, 41669 (A, K) – pat, 42768 (A) – pent, 42812 (A) – pat, 45516 (A) – pat, 46982 (A) – pat, 47092 (BM, SING) – pent, 48838 (E, SING) – pent, 49820 (B) – cum, 75391 (SING) – pat, 77074 (K, SING) – cer, 79163 (SING) – pat, 83392 (A, SING) – pent, 83618 (A, SING) – pent, 83702 (A) – caul, *BSIP* 2717 (LAE) – lasioc-schum, 3164 (K, LAE) – lasioc-schum, 3181 (K, LAE) – lasioc-schum, 3209 (K, LAE) – lasioc-schum, 3650 (K, SING) – lasioc-schum, 3772 (K, LAE, SING) – lasioc-schum, 3859 (K, LAE, SING) – lasioc-schum, 4379 (K, LAE) – lasioc-schum, 4783 (K, LAE) – lasioc-schum, 5075 (K, LAE) – lasioc-schum, 5134 (K, LAE) – lasioc-schum, 5195 (K, LAE) – lasioc-schum, 5364 (LAE) – lasioc-schum, 5447 (K, LAE, SING) – lon, 5878 (K, LAE, tending to trichocladus) – lasioc-schum, 6016 (K, LAE, SING) – lasioc-schum, 6755 (K, LAE) – lasioc-schum, 6929 (K, LAE) – lasioc-schum, 7178 (K, LAE) – lasioc-schum, 7233 (K, LAE) – lasioc-schum, 7397 (K, LAE) – lon, 7573 (K, LAE, SING) – lasioc-schum, 7698 (K, LAE) – lasioc-schum, 7731 (LAE) – lasioc-schum, 8320 (K, LAE, SING) – lasioc-schum, 8670 (K, LAE, SING) – lasioc-schum, 9589 (K, LAE) – lasioc-schum, 10428 (K, LAE, SING) – lasioc-schum, 10789 (K, LAE, SING) – lasioc-schum, 10941 (K, LAE, SING) – lasioc-schum, 11013 (K, LAE) – lasioc-schum, 11289 (LAE, SING) – lasioc-schum, 11410 (K, LAE) – lasioc-schum, 12081 (LAE) – lasioc-schum, 12314 (LAE) – lasioc-schum, 12669 (K, LAE) – lasioc-schum, 12846 (LAE, SING) – lasioc-schum, 13452 (LAE) – lasioc-schum, 13586 (LAE) – lasioc-schum, 14667 *p.p.* (LAE) – lon, 14889 (LAE) – lon, 15620 (K, LAE) – lasioc-schum, 15746 (LAE) – lasioc-schum, 16239 (K, LAE, SING) – lasioc-schum, 16442 (LAE) – lasioc-schum, 16607 (K, LAE) – lasioc-schum, 17303 (K, LAE) – lasioc-schum, 17461 (K, LAE) – lasioc-schum, 18831 (K, LAE) – lasioc-schum, 18902 (K, LAE) – lasioc-tric, 18990 (LAE) – lasioc-schum; *Bunchuai* 458 (FHO) – cum-bal; *Bur. Agr.* 1932 (K) – pent, 1939 (A, K) – pent, 2046 (SING) – pent, 2605 (K) – pent; *Burkill* 1312 (SING) – pat, & *Haniff* 12985 (K, KEP, SING) – per, 36622 (CALC) – cum-bal, *s.n.* (A, K, SING) – pat; *Burn Murdoch* 199 (SING) – tom, 201 (SING) – pent-pauc; *BW* 314 (L, LAE) – cer, 359 (L, LAE) – cer, 488 (L, LAE) – cer, 645 (LAE) – cum, 657 (L) – cer, 786 (K, L, SING) – cer, 804 (LAE) – ste, 817 (L) – cer, 1040 (LAE) – lasioc-wein, 1259 (K, LAE) – lasioc-wein/schum, 1454 (L) – lasioc-tric, 1625 (K, L, LAE, SING) – cer, 2218 (L, LAE) – lon, 2219 (LAE) – lon, 2220 (K) – lon, 2536 (L) – cer, 2695 (K, L, LAE) – cer, 2747 (K, LAE) – lasioc-schum, 2906 (L, LAE) – cer, 3410 (L) – cer, 3762 (LAE) –

lasioc-schum, 3940 (LAE) – lon, 3941 (LAE) – lon, 3963 (L, LAE) – cer, 4444 (L) – cer, 4668 (L) – lasioc-pach, 5155 (LAE) – lasioc-wein, 5627 (KEP, L, LAE) – cer, 5765 (L, LAE) – cer, 6293 (LAE) – lasioc-wein, 6703 (L, LAE) – lasioc-tric, 6815 (K, L, LAE) – lasioc-tric, 6998 (L) – cer, 7086 (SING) – lasioc-schum, 7701 (LAE) – cum, 7832 (L) – cer, 8106 (LAE) – lon, 8151 (LAE) – ste, 9152 (LAE) – cum, 9220 (LAE) – ste, 9202 (LAE) – cum, 9381 (LAE) – cum, 9771 (LAE) – lasioc-wein, 9833 (L, LAE) – cer, 9859 (LAE) – lasioc-wein, 10000 (L) – cer, 10085 (K, L, LAE) – cer, 10818 (LAE) – cum, 10842 (L, LAE) – lasioc-tric, 10859 (L, LAE) lasioc-tric/wein, 10950 (LAE) – lasioc-wein, 10959 (LAE) – lasioc-wein, 11021 (L, LAE) – cer, 11322 (L) – lasioc-pach, 11323 (L) – lasioc-pach, 11365 (K, L, LAE) – cer, 11683 (L) – cer, 11928 (L) – cer, 12144 (K, LAE) – cer.

Cantley's Coll. 2110 (?) (SING) – pend, *s.n.* (SING) – pend; *Carman* 50 (LAE) – cum; *Carr* 11589 (BM) – lasioc-wein, 12156 (BM, SING) – lasioc-novog/wein, 13243 (BM) – say, 13244 (BM, SING) – say, 13334 (BM, K, SING) – say, 13691 (BM, K) – say, 14259 (BM, K, L, SING) – say, 14484 (BM, K) – say, 14517 (BM, K, L, SING) – say, 14526 (BM, K, SING) – say, 14658 (BM, K, SING), lasioc-wein, 14757 (L, SING) – say, 14811 (BM, K, SING) – say, 14997 (K, SING) – lasioc-wein, 15396 (BM, K, L, SING) – say, 15797 (BM, L) – lon, 15887 (B, BM, SING) – lon, 15888 (B) – lon, 15920 (B) – say, 15921 (B) – say, 15951 (B, BM) – lasioc-wein, 16116 (SING) – say, 16232 (B, BM) – cum, 16268 (B, L, SING) – say, 16405 (B, BM, L) – cum, 16465 (SING) – cer; *Castro & Melegrito* 1441 (BM, K) – pent, 1612 (BM) – pent; CF 528 (SING) – pent-pauc, 968 (KEP, SING) – cer, 1134 (SING) – tom, 1588 (SING) – tom, 2439 (K) – cer, 3228 (K, SING) – pent-pauc; *Chand* 3061 (L) – cum-bal; *Chew* 244 (SING) – sar, 480 (K, SAR) – pent-pauc, 510 (A, K, L, SAR, SING) – rub, 955 (K) – pent-pauc, 1042 (L) – macra, 1175 (SING) – sar; *Chew, Corner & Stainton* 84 (K) – pent-med, 522 (K, SAN, SING) – pat, 1167 (K, SING) pat, 2693A (K, L, SAN) – cum-kin, 2827 (K, L, SAN) – cum-kin; *Ching* 8484 (A) – cum-bal; *Clemens* 103B (L) – lasioc-wein, 307 (L) – say, 311A (L) – say, 459 (A) – say, 535 (L) – lasioc-pach, 562 (L) – lasioc-pach, 854 (L) – say, 856B (L) – lasioc-wein, 1284 (L) – lasioc-pach, 1687 (G) – cum, 3825 (A) – ten, 3986 (A) – ten, 6588 (A, B) – ten, 7053 (K) – med, 8222 (L) – cum, 8391 (A) – cum, 10164 (A) – pent-med, 10389 (A) – cum-kin, 10414 (A, K) – cum-kin, 10431 (BM, K) – macra, 10903 (E) – lasioc wein, 11371 (E) – cum, 18061 (BM) – pent, 20023 (BM) – med, 20647/?26467 (A, BM, L, SING) – lan, 26080 (BM, K) – gra, 26100 (A, B, BM, G, K, L, SING) – cer, 26114 (L, SING) – macra, 26206 (A, BM, K) – pent-med, 26280 (BM, K) – macra, 26373 (A, BM, G, K, L) – poly, 26428 (BM) – gra, 26504 (BM) – gra, 26513 (BM) – macra, 26535 (A, B, BM, G, K, L) – lan, 26537 (BM) – gra, 26610 (BM) – macra, 26636 (BM) – poly, 26814 (BM, K) – gra, 26824 (BM) – cum-kin, 27015 (A, BM, K) – gra, 27217 (BM, G, K, L) – macra, 27299 (A, B, BM, G, K) – gra, 27892 (A, B, BM, G, K, L) – cum-kin, 28148 (A, G) – cum-kin, 28504 (A, B, BM, G, K) – cum-kin, '28862–30215' (A, B, BM, G, K, L) – cum-kin, '28872–30213' (A, BM, L) – cum-kin, 29310 (BM) – cum-kin, 29451 (A, B, BM, G, K) – cum-kin, 30214 (A, G, K) – pent-med, 30218 (A) – gra, 30220 (G, K, L) – macra, 32158 (BM, G, K) – cer, 40615 (A, BM, G, K) – cer, 41342 (E) – lasioc-wein, 50043 (A, BM, G, K) – lan, 50391 (BM, K) – cer, 50411 (BM, G, K, L) – macra, 51302 (K) – macra, *s.n.* (G) – cer, *s.n.* (March, 1907) (G) – macra, *s.n.* (June 1907) (G) – pat, *s.n.* (Sept. 1907) – macra, *s.n.* (Sept. 1931) – cer; *Mrs Collins s.n.* (K) – pend; *Corner s.n.* (LAE, SING) – pat, *s.n.* (SING) – pat, *s.n.* (SING) – pend, *s.n.* (SING) – pent-pauc, *s.n.* (SING) – sar; *Cowan s.n.* (E) – cum-bal, *s.n.* (E, K) – cum-bal; *Craven & Schodde* 157 (K, LAE) – lasioc-schum, 863 (K, LAE) – lasioc-wein; *Cuming* 683 (BM, G, K, L, LE, OXF) – pent, 822 (A, BM, CGE, G, K, L, OXF) – pat, 842 (A, BM, G, K, L, LE) – cum; *Curtis* 460 (BM, SING) – pend, 655 (K, SING) – pent-pauc, 892 (SING) – pat, 1493 (SING) – pent-pauc, 1519 (CALC, K, SING) – tom, 1685 (CALC, K, SING) – pat, 2002 (SING) – cer, 2327 (SING) – macro, 2469 (BM, CALC, K, K[ex SING]) – macro, 2693 (CALC, SING) – per, *s.n.* (K) – pat, *s.n.* (MPU) – pat, *s.n.* (SING) pend, *s.n.* (SING) – pauc, *s.n.* (April 1890) – (SING) – pent-pauc.

Darbyshire 283 (K, LAE) – lasioc-pach, 718 (K, LAE) – lasioc-wein, 852 (LAE) – cer, 968 (K, LAE, SING) – say; *Docters van Leeuwen* 9697 (L) – lasioc-schum, 9711 (L) – lasioc-schum, 9927 (K, L) – cer, 11268 (K, L, SING) – cum; *Doppler* (?) *s.n.* (BM) – cum-bal; *Dumas* 1571 (L) – pat; *Dussault* '85' (P) – lao.

Elmer 7507 (A, BM, BP, E, LE) – pent, 7837 (BP) – pat, 8155 (G) – cum, 8169 (BP, K, LE) – cum, 8828 (E, G) – pent, 8964 (A, BM, K) – cum, 9304 (A, BM, BP, E, G, LE) – cum, 10379 (A, BP, E, K, LE) – pent, 10697 (BM, K, L) – macra, 10884 (A, BM, BP, G, K,L, U) – pat, 11082 (BM, K, L) – macra, 11618 (A, BM, BP, G, K, L, U)– cer, 13487 (A, BM, G, K, U) – cer, 13592 (A, BM, BP, G, K, U) – pat, 13924 (A, BM, BP, K, U) – pent, 14395 (A, BM, BP, G, U) – pent, 15209 (A, BM, BP, K, U) – pent, 15451 (A, BM, G, K, U) – cum, 15496 (A, BM, BP, K, U) – pent, 15776 (A, BM, K, U excl. fls) – pent, 15857 (A, BM, BP, K, U) – pent, 16698 (A, BM, BP, G, K, U) – cer, 17552 (A, BM, BP, K, U) – pent, 18055 (A, BM, BP, K, U) – cum, 18285 (A, BM, BP, K, U) – pent, 20687 (A, BM, BP, G, K, U) – pent-med, 21541 (A, G, K, L, SING) – med, 21552 (BM, K, L, SING, U) – pent- pauc, 21706 (A, BM, BP, G, K, U) – pent-med, 21826 (A, BM, BP, G, K, U) – pent-med, 21834 (A, BM, G, K, SING, U) – sar, 21861 (K, L, SING) – macra; *Endert* 2591 (L) – macra, 4766 (K, L, SING) – med, 5127 (L, SING) – lan; *Evrard* 766 (P, photo FHO) – pell; *Expo. Paris* 64 (L) – ama.

FB 78 (BM) – pent, 417 (K, SING) – pent, 651 (K, SING) – pent, 718 (K, SING) – pent, 993 (K) – pent, 1470 (K) – pent, 1482 (BM) – pat, 1653 (K) – pat, 1743 (K) – pat, 1800 (K) – pent, 2250 (SING) – pent, 2441 (SING) – pat, 3187 (K, SING) – pent, 3664 (K) – cer, 3679 (K) – pent, 4097 (K) – pat, 5765 (LE) – pent, 10273 (G) – cum, 18965 (BM) – pent, 22702 (K) – pent, 22805 (A, SING) – pent, 22852 (A) – pat, 23880 (A) – pent, 24645 (BM) – pent, 24707 (A) – pent, 25467 (K) – pent, 28650 (BM) – pent, 29043 (K) – pat, 29045 (SING) – pent, 29048 (BM) – pent, 29545 (A, SING) – pent; *FD* 720 (SING) – pat, 1355 (K) – pent-pauc, 1837 (KEP, SING) – sar, 2275 (K) – tom, 2844 (KEP) – cer, 3228 (SING) – pent-pauc, 4620 (K) – pent-med, 4771 (K) – pent-med, 5120 (KEP) – sar, 8038 (FHO, KEP) – pat, 10457 (K, KEP) – pat, 10463 (K, KEP) – pat, 11156 (KEP, SING) – sar, 13077 (KEP) – pat, 13385 (KEP) – macro, 13609 (KEP) – sar, 14355 (KEP, SING) – pat, 20410 (SING) – macro, 23346 (SING) – pend, 25576 (KEP) – pent-pauc, 28228 (KEP) – pat, 38021 (KEP) – cer, 48623 (KEP) – pent-pauc; *Fénix* 28223

(A) – cum, 28230 (A, BM, K) – cum, 28243 (K) – cer; *Fleury* 30107 (P) – cum-bal, 32160 (P) – cum-bal; *FMS* 10468 (SING) – pend; *Forbes* '62' (G) – lasioc-novog, 69 (BM) – say, 88 (BM, L) – cer, 179[a] (BM) – say, 270 (BM) – say, 714 (BM, G) – lasioc-novog, 834 (G) – lasioc-novog, 1319 (CALC) – lasiog, 1325 (BM) – lasiog, 1363 (BM) – lasiog, 1383 (A, BM) – lasiog, 2723 (BM, L, LE, SING) – pat, 2755 (BM, L) – cer, 2928 (A) – macro, 1399 C (BM) – lasiog; *For. Guard* 592 (SING) – pat, *s.n.* (BM) – pend; *Foxworthy* 23 (A) – cum; *Frake* 950 (A) – cum; *FRI* 6 (K, KEP, L, SING) – pat, 96 (K, KEP, SING) – pat, 681c (A, K) – cer, 741 (A, K, L, SAN, SING) – pat, 900 (KEP, SAN, SING) – macro, 1010 (KEP, L, SING) – tom, 1534 (K, L, SAR, SING) – pat, 2048 (A, K, KEP, L, SAN, SING) – macro-mac/fulv, 2130 (K, KEP, L, SAN, SING) – pat, 2225 (K, L, SING) – pat, 2287 (KEP, L) – pat, 2298 (KEP, SING) – pent-pauc, 2300 (KEP) – pent-pauc, 2320 (K, KEP, L, SING) – ery, 2400 (K, L) – sar, 2505 (KEP) – pend, 2554 (KEP) – pent-pauc, 2579 (K, KEP, SAR) – pat, 2579A (L) – pat, 2876 (K, KEP) – per, 2946 (K, KEP) – macro-fulv, 2966 (KEP) – tom, 3037 (KEP, L, SING) – pat, 3152 (A, K, KEP, SAN SING) – cer, 3463 (A, K, KEP, L, SAN, SING) – tom, 3517 (A, KEP, L, SING) – pauc, 3587 (A, K, KEP, L, SAR, SING) – cer, 4174 (A, K, KEP, SING) – cer, 4352 (KEP) – tom, 4475 (K, KEP, SAR, SING) – tom, 4495 (K, KEP, L, SING) – macro-fulv, 4615 (KEP) – pat, Ja 4647 (L) – macro, 4964 (KEP) – pat, 6371 (KEP) – cer, 6526 (K, KEP) – tom, 6774 (K, KEP, SAR) – cer, 6886 (K, KEP, L, SING) – pauc, 6934 (K, KEP, SAR) – pat, 6974 (K, KEP, SING) – pauc, 7053 (K, KEP, L, SAR) – macro-fulv, 7227 (A, K, KEP) – sar, 7240 (A, K, KEP, SING) – sar, 7436 (KEP, L, SAR) – cer, 7444 (KEP) – cer, 7596 (K, KEP, L, SAR) – pent, 7855 (KEP, L) – pauc, 8252 (KEP) – pend, 8353 (K, KEP) – sar, 8434 (K, KEP, L) – pend, 8763 (K, KEP) – pent-pauc, 10644 (K, KEP) – macro-mac/fulv, 11153 (KEP) – pat, 11266 (K, KEP, SING) – macro, 11369 (K, KEP, SING) – sar, 11595 (K) – tom, 11654 (K, KEP) – pend, 11721 (K) – pent-pauc, 11857 (K, KEP, L, SING) – cer, 12050 (K, L, lvs of *Aglaia:* KEP) – cer, 13130 (K, KEP, SING) – macro-fulv, 13204 (K, KEP, L) – macro-fulv, 13242 (K, KEP, SING) – macro-fulv, 13433 (A, K, KEP, L, SING) – sar, 13627 (A, K, KEP) – sar, 13677 (K, KEP, SING) – cer, 13699 (A, K, KEP, L, SING) – macro-fulv, 13762 (A, K, KEP L) – pat, 14120 (A, K, KEP, SING) – pauc, 14411 (A, K, KEP, L, SING) – macro-fulv, 14522 (A, K, KEP) – macro-fulv, 14680 (K, KEP) – tom, 14700 (K, KEP) – tom, 14802 (K) – cer, 14827 (K) – pat, 14896 (K) – cer, 15310 (K, KEP) – pent-pauc, 15319 (K, KEP) – macro-fulv, 15620 (K, KEP) – pent-pauc, 15729 (KEP) – cer, 15737 (K, KEP) – sar, 15802 (K) – tom, 15813 (KEP) – macro-fulv, 15832 (KEP) – cer, 16396 (K, KEP) – tom, 16397 (K) – pauc, 16943 (KEP) – pat, 17151 (K, KEP, SAR, SING) – ery, 17256 (K, KEP, SING) – macro-fulv, 17323 (K, KEP, SING) – ery, 17742 (K, KEP) – sar, 19017 (KEP) – macro-fulv, 19278 (KEP) – pend, 19811 (K, KEP) – pent-pauc, 20130 (K) – macro-fulv, 21571 (K) – cer, 23361 (K) – cer.

Gamble 7697 (K) – cum-bal; *Garrett* 1224 (E, K, L) – cum-bal; *Geesink et al.* 5283 (K) – pat, 5724 (K) – cum-bal; *Gjellerup* 596 (L) – lasioc-pach, 726 (?L) – lasioc-tric, 732 (L) – lasioc-wein; *Gomez* '355' (BM, K-W, LE) – grand; *Grashoff* 741 (L) – pat, 808 (L) – ama; *Griffith* 660 (BM) – cum-bal, 1062/1 (A, K, L) – pat, '1063' (A, K) – cum-bal, '1065' (K) – pend, '1084' (K) – cum-bal, 1845 (CGE, K) – pat, *s.n.* (BM, CGE, MPU) – pat, *s.n.* (K, MPU) – cum-bal.

Haines 342 (K) – cum-bal; *Hallier* 466 (G, K) – sar, 1938 (K, L) – macra; *Haniff* 15517 (K, SING) – pat, 21031 (SING) – pend; *Hardiel & Sidek* 452 (K, L, LAE, SING) – sar, 457 (K, LAE, SAN, SAR, SING) – pat, 644 (LAE) – pat; *Hartley* 9901 (G, LAE) – lasioc-wein, 9902 (G, K, L, LAE) – cer, 10081 (K, LAE) – cum, 10238 (A, G, LAE) – say, 10603 (G, K, LAE) – lasioc-wein, 10760 (A, LAE) – sap, 10954 (K, LAE) – lasioc-wein, 10995 (LAE) – sap, 10996 (K, LAE) – cum, 11081 (K, LAE) – say, 11867 (K, LAE) – say, 11919 (LAE) – say, 12193 (K, LAE) – say, 12397 (G, LAE) – cum, 12648 (G, K, L, LAE) – sap; *Haviland* 594 (K, SAR) – rub, 597 (K) – ama, 992 (SAR) – ama, 1601 (K, SAR, SING) – sar, 1777 (SAR) – cum-kin, 1883 (K) – ama, 2379 (SAR) – ama, 2853 (K, SAR) – ama, 2854 (K, SAR) – ama, b z f d (K) – pent-pauc, c p g c (K) – sar; *H. Bot. Bogor* 126 (U) – pent; *Henderson s.n.* (SING) – pend; *Hollrung* 698 (K, L. LE) – lasioc-schum; *Holttum* 9628 (K, SING) – pauc; *Hoogland* 3447 (G, L, LAE) – cer, 3728 (BM, K, LAE) – say, 4898 (L, LAE) – lasioc-schum, 4931 (LAE) – lasioc-tric, 4932 (LAE) – lasioc-tric, *Hoogland* [*& Pullen*] 6178 (BM, G, K, L, LAE) – pohl, 8905 (K, L, LAE) – lasioc-wein, [*& Craven*] 10118 (K, L, LAE) – lasioc-wein, 10161 (K, L, LAE) – cer, 10504 (L, LAE) – cer, 19627 (K, LAE) – lasioc-pach; *Hornabrook* 45 (LAE) – mont; *Hotta* 12947 (SAR) – pat; *Hull* 133 (SING) – pat; *Hullett* 800 (K) – pat; *HUM* 9027 (KLU) – pent-pauc; *Hyland* 2163 (LAE) – lon, 7955 (K) – lon.

Jacobs 4829 (K, L) – macro, 4860 (L) – macro, 5141 (B, K, L, SAR) – rub, 7872 (A, K, L) – pent, 8485 (K, L) – lasiog; *Jaheri* 529 (K) – sar, *s.n.* (K) – sar; *Jelinck s.n.* (LE) – pat; *Jenkins* '408' (A) – cum-bal, 413 (A) – cum-bal, *s.n.* (CALC, CGE, K) – cum-bal; *Junghuhn* 6 (L) – pat, '25' (L) – pent-pauc, '127' (L) – cer, '216' (K) – lasiog, *s.n.* (L) – cer.

Kadim & Noor 414 (K, L, SING) – pat; *Kajewski* 1997 (BM, G) – lasioc-schum, 2545 (BM, SING) – lasioc-schum; *Kanehira & Hatusima* 11478 (A) – ste, 11499 (A) – cer, 12719 (A) – say; *KEP* 7195 (KEP) – tom, 7296 (KEP) – cer, 12890 (SING) – macro, 17101 (KEP, SING) – ama, 20410 (SING) – macro-fulv, 24124 (SING) – pauc, 25159 (SING) – macro, 27919 (SING) – macro, 32552 (KEP) – ama, 44919 (K, KEP) – pat, 51961 (K, KEP) – sar, 52293 (KEP) – tom, 63123 (KEP) – pat, 63144 (KEP) – tom, 64090 (KEP) – ery, 64313 (KEP) – sar, 64337 (KEP) – sar, 64338 (KEP) – sar, 64530 (KEP) – ery, 64571 (KEP) – ery, 64596 (KEP) – ery, 64772 (KEP) – ery, 64782 (KEP) – pat, 65140 (KEP) – sar, 66640 (K, KEP) – macro, 68812 (KEP) – cer, 71153 (KEP) – ery, 71238 (KEP) – pat, 72431 (FHO, K, KEP, L, SING) – pat, 73502 (KEP) – pent-pauc, 76583 (KEP, SING) – ama, 77691 (K) – pent-pauc, 77783 (L, SING) – macro-fulv, 85233 (K, KEP, SING) – pat, 85240 (K, KEP, SAN, SAR, SING) – macro, 94082 (K, KEP) – pent-pauc, 94088 (A, K, KEP, L) – pat, 94679 (K, KEP) – macro-fulv, 94698 (L) – cer, 94747 (K, KEP, L, SING) – pat, 95007 (A, K, KEP, L, SAN, SING) – macro-fulv, 95010 (A, KEP, L, SAN, SING) – pat, 95012 (K, KEP, L, SAN, SING) – cer, 97728 (A, KEP, SING) – pat, 97758 (KEP) – sar, 97761 (K, KEP, SAN, SAR, SING) – pat, 97846 (KEP, SING) – pat, 97966 (KEP) – tom, 98236 (KEP, L, SING) – pat, 98513 (K,

KEP, L. SAN, SING) – cer, 98548 (KEP, L) – pat, 98578 (K, KEP, SAN, SING) – ery, 98829 (K, KEP) – pauc, 98937 (A, K, KEP, L, SAN, SING) – cer, 99006 (K. KEP, SING) – pauc, 99018 (K, KEP, L) – macro, 99096 (KEP) – tom, 99160 (KEP) – tom, 99224 (KEP) – pent-pauc, 99379 (K, KEP) – cer, 99391 (K, L) – pauc, 99461 (KEP, SING) – macro, 99462 (K, KEP) – macro, 99588 (L, SING) – cer, 99818 (SING) – macro, 110338 (KEP, L) – pauc, 115694 (KEP) – tom, 115695 (K, KEP, L, SAR, SING) – pat; *Kerr* 2922 (K) – cum-bal, 5135 (K) – cum-bal, 6171 (K, SING) – cum-bal, 19217 (K, L, P) – pend; *Kiah s.n.* (KEP, SING) – pend; *King* '262' (CALC) – tom; *King's Coll.* 1746 (BM, CALC, K) – pent-pauc, 1876 (CALC) – sar, 2634 (CALC, G) – cer, 2876 (BM, G, K) – pauc, 3128 (BM, CALC (photo FHO), K, U) – pauc, 3187 (G, K) – cer, 3235 (A) – cer, 3312 (BM, K) – pat, 3313 (CALC (photo FHO), K) – pauc, 3396 (CALC, K) – pent-pauc, 3467 (CALC (photo FHO), K) – pauc, 3542 (K) – sar, 3848 (LE) – tom, 3946 (G, K, L, SING) – tom, 4348 (CALG, G, L) – sar, 4455 (CALC, L, SING) – pauc, 4502 (BM, SING) – pend, 4631 (G, K) – pat, 4795 (BM, G, LE, SING) – pat, 4860 (K) – pat, 5095 (BM, E, G, K, L, LE, SING) – tom, 5305 (G, L, LE, SING) – per, 5318 (BM, SING) – pend, 5343 (CALC) – tom, 5735 (CALC, CGE, E, K, SING) – sar, 5765 (CALC, G, K, L, LE) – pat, 5894 (CALC, K) – pend, 6137 (G, K, SING) – per, 6272 (CALC) – pend, 6864 (K) – sar, 7783 (BM, CALC, K) – sar, 8320 (L) – per, 8462 (BM, G, K) – pat, 10181 (BM, K) – cer, 10227 (G, K) – pat, 10266 (CGE, LE, SING) – pat, 10624 (CALC, LE, SING) – pat, 10750 (CALC, CGE, E, LE, SING) – pat, 11067 (CALC, K) – pauc, 11502 (CALC, SING) – pend, *s.n.* (Nov. 1881) (CALC) – sar; *Kingdom Ward* 12837 (BM) – cum-bal; *Kloss s.n.* (K) – pat; *Koerniasih* 31 (K, SING) – lasioc-wein; *Køie & Olsen* 1184 (FHO) – lasioc-wein; *Koorders* 4778*β* (A, L) – macro, 4878*β* (L) – macro, 4879*β* (L) – macro, 4880*β* (G, LE) – pat, 4883*β* (G, L) – macro, 4886*β* (G) – cer, 4887*β* (K, L) – cer, 4890*β* (K, LE) – pat, 4891*β* (G) – pat, 4892*β* (K, L) – macro, 4963*β* (K) – pat, 4991*β* (G, K, L) – macro, 4998*β* (L) – cer, 5020*β* (FHO) – pat, 5044*β* (L) – macro, 5065*β* (L) – macro, 5075*β* (G) – pent, 5076*β* (L) – macro, 5077*β* (K) – pent, 5078*β* (L) – macro, 5092*β* (K) – pent, 5329*β* (L) – macro, 5977*β* (K, L) – macro, 5999*β* (L) – macro, 6011*β* (L) – macro, 6020*β* (K, L) – cer, 12445*β* (SING) – pat, 12716*β* (G) – pent, 13564*β* (K) – pent, 14593*β* (FHO) – cer, 17948*β* (K, L) – cel, 17949*β* (L) – pat, 17950*β* (L) – cel, 17957*β* (K) – cel, 17958*β* (L) – cel, 17960*β* (K, L) – ko, 17964*β* (L) – ko, 17965*β* (L) – cel, 17973*β* (K, L) – ko, 17975*β* (L) – cel, 17977*β* (L) – cel, 17978*β* (L) – ko, 17988*β* (L) – cel, 17989*β* (L) – ko, 19701*β* (L) – cel, 19961*β* (LE) – pent, 19963*β* (L) – macro, 20852*β* (L, LE) – macro, 21872*β* (K, L) – pent, 21874*β* (K) – pent, 22673*β* (K) – pent, 22680*β* (FHO) – pent, 23020*β* (FHO, L) – macro, 23722*β* (L–) – macro, 28764*β* (L) – cer, 28985*β* (L) – cer, 29311*β* (SING) – cer, 29315*β* (L) – macro, 31350*β* (K) – pent, 31350*β* (K, L) – pent, 33016*β* (L) – macro, 33874*β* (L) – macro, 38283*β* (K) – cer, 38370*β* (L) – macro, 38760*β* (LE) – cer, 38771*β* (K) – pat, 38814*β* (L) – macro, *s.n.* (LE) – pat; *Kornassi* 578 (K, L) – lasioc-wein/lasioc; *Korthals* '121' (L) – cer, ?871 (L) – pat, *s.n.* (A, L, LE, U) – div, *s.n.* (L) – ama, *s.n.* (L) – pat, *s.n.* (L, U) – ama, *s.n.* (L, U) – pent-pauc, *s.n.* (U) – cer, *s.n.* (U) – pat; *Kostermans* 1A (G, K, LAE, SING) – pent, 44A (K) – pent, – & *Kuswata* 64 (K) – pent, 75A (K) – pent, (*UNESCO*) 143 (A, BM, K, KEP, LAE, SAN, SING) – pat, – & *Soegeng* 199 (L) – lasioc-pach, – & *Wirawan* 202 (K, L) – pent, 207 (K, L) – cer, 260 (= *bb* 33459) (SING) – cer, 275 (= *bb* 33475) (L, SING) – cer, 374 (K) – pat, KK & SS 383 (K, KEP, SING) – pent, – & *Wirawan* 413 (SING) – pent, 489 (L) – lasioc-pach, – & *Anta* 1038 (A, L) – pat, 1134 (SING) – cer, 2650 (L, SING) – lasioc-pach. 2650A (L) – cer, 4175 (A, SING) – B, 4361 (BM, G, K, LAE, SING) – pat, 4892 (BM, K) – pent, 5490 (SING) – lan, 5592 (A, K, L, LAE, SING) – ko, 5750 (K, LAE) – pent, 5897 (A, G, K, KEP, L, LAE) – med, 6224 (K) – pent-med, 6225 (A) – cer, 6834 (A) – macro, 7383 (A, K, SING) – B, 7694 (BM, K, LAE, SING) – pat, 8026 (L) – ama, 8127 (K, L, SING) – pat, 8681 (L) – pent-pauc, 8900 (L, LAE, SING) – sar, 9021 (SING) – lan, 9140A (L) – lan, 9141 (A, K, L, SING) – ery, 9318 (A, K, L, SING) – sar, 9571 (K, L, SING) – macro, 9963 (K, SING) – pat, 10024 (L) – B, 10172 (BM, K) – pat, 10195 (K, SING) – pat, 10523 (L) – lan, 10558A (K, L, SING) – B, 10716 (K) – sar, 11027 (K, SING) – lasioc-wein, 11208 (A, K) – cum-bal, 13249 (L, SING) – lan, 13460 (L) – pent-pauc, 13967 (K, L) – med, 18093 (A, K, L) – pent, 18254 (A, K, L) – pent, 18318 (A, K, L) – pent, 19083 (A, K, L, LAE) – pent, 19369 (A, K) – macro, 21585 (SAR) – saras, 22001 (L) – pent-pauc, 22014 (L) – pent-pauc, 23821 (G, K) – pat, 23890 (K) – pat; *Krukoff* 4041 (G, L) – lasiog, 4214 (A, L, LE, SING) – cer, 4234 (G, L, LE) – pat, 4255 (G, SING) – pat; *Kunoeang in Haviland* c o d z (BM (?), K, SAR) – set; *Kunstler* 3187 (L) – macro; *Kurz s.n.* (U) – pat; *Kuswata & Soepadmo* 41 (A, K, L, SING) – cer, 135 (A, L) – cer, 166 (A, K) – cer, 297 (K, L) – pent, 873 (K) – pent-pauc.

Lace 3059 (E) – cum-bal, *s.n.* (E) – cum-bal; *LAE* 50004 (K, LAE) – ste; 50356 (LAE) – say, 51216 (K, LAE) – lasioc-tric, 52075 (K, L, LAE) – cer, 52087 (K, L, LAE) – cer, 52097 (K, L, LAE) – lasioc-wein, 52100 (K, L, LAE) – cer, 52110 (L, LAE) – lasioc-tric, 52126 (LAE) – lasioc-tric, 52134 (K, L, LAE) – lasioc-wein, 52156 (K, L, LAE) – lasioc-wein, 52168 (K, L, LAE) – lasioc-wein, 52343 (LAE) – lasioc-schlec, 52830 (K, L LAE) – lasioc-car, 52941 (K, L, LAE) – cer, 52942 (K, L, LAE) – lasioc-wein, 53441 (KLU, LAE) – lasioc-wein, 53855 (L, LAE) – lasioc-novog, 53857 (L, LAE) – lasioc-novog, 55778 (K, L, LAE) – lasioc-wein, 56353 (K, LAE) – sap, 56356 (LAE) – say, 56360 (K, LAE) – say, 58001 (L, LAE) – cer, 58003 (K, L, LAE) – cum, 58007 (E, K, L, LAE) – cum, 58011 (LAE) – lasioc-wein, 58013 (K, LAE) – lasioc-wein, 58064 (LAE) – cum, 58065 (L, LAE) – mont, 58067 (LAE) – ten, 58075 (E, K, L. LAE, SING) – mont, 58082 (LAE) – sap, 58083 (K, LAE) – sap, 58171 (L, LAE) – say, 58173 (LAE) – say, 58175 (LAE) – say, 58185 (LAE) – lasioc-wein, 58697 (LAE) – lasioc-wein, 58703 (LAE) – lasioc-tric, 60170 (K, LAE) – say, 60347 (K) – cer, 66519 (K) – lasioc-wein; *Lake & Kelsall s.n.* (SING) – pend; *Lakshnakara* 643 (L) – cer; *Lam* 502 (L) – lasioc-form, 573 (L) – lasioc-form, 1201 (L) – lasioc-pach; *Larsen et al.* 2623 (E, K, L) – cum-bal; *Ledermann* 6707 (B) – cer, 6717 (B) – lasioc-?schum, 9661 (B) – lasioc-tric, 10401 (B) – cer, 13096 (B) – lasioc; *Liang* 69470 (A) – cum-bal; *Loher* '260' (K) – cum, 265 (K) – pent, 266 (K) – cum, 5655 (K) – pent, 5662 (K) – cum, 5665 (K) – pent, 5666 (B, K) – pent, 5681 (K) – pent, 5687 (K) – pat, 5693 (K) – cum, 5700 (K) – pent, 6749 (K) – pat, 5865 (K) – pat, 13969 (A) – pat, 14501 (BM) – pat; *Lörzing* 5505 (K, U) – cer, 5518 (U) – cer, 12785 (A, K, L) – cer; *Lütjeharms* 5246 (K) – pat.

Mabberley 1542 (FHO) – tom, 1546 (FHO) – macro, 1547 (FHO) – macro, 1551 (FHO) – pat, 1553 (FHO) –

macro, 1556, 1557, 1561 (FHO) – tom, 1560 (FHO) – pat, 1573 (FHO) – cer, 1624 (FHO, SAR) – cer, 1635 (FHO) – rub, 1637 (FHO) – rub, 1645 (FHO) – sar, 1645 (FHO) – sar, 1653 (FHO) – pent-med, 1651 (FHO) – pent-med, 1655 (FHO) – sar, 1663 (FHO) – sar, 1669 (FHO) – pent-med, 1676 (FHO, K) – pent-med, 1680 & 1682 (FHO) – med, 1688 (FHO) – poly, 1690 (FHO) – sar, 1708, 1709 (FHO) – poly, 1716 (FHO) – sar, 1718 (FHO, SAN) – macra; *Mabberley & Henty* 1720 (FHO, LAE) – cer, *Mabberley* 1721, 1726 (FHO, LAE) – lasioc-wein, 1742 (FHO, LAE) – cum, 1745 (FHO, K) – sap, 1746 (FHO) – sap, 1747 (FHO, LAE) – lasioc-schum, 1748 (FHO, LAE) – cer, 1751 (FHO, LAE) – lasioc-tric, 1753 (FHO, LAE) – lasioc-tric, 1754 (FHO, LAE) – lasioc-schum, 1757 (FHO, LAE) – cum, 1763 (FHO) – mont, 1765 (FHO, LAE) – ten, 1766 (FHO, K) – mont, 1772 (FHO, LAE) – pohl, 1773 (FHO, K, LAE, UPNG) – scho, 1788 (FHO, K, LAE) – say, 1789 (FHO, LAE) – say, 1793 (FHO, K, LAE) – lon, 1797 (FHO) – pat; *MacAdam* 264 (LAE) – cum; *Macgregor* 546 (CALC, E) – cum-bal; *McIntosh* W79 (LAE) – lon; *McKee* 6240 (K) – cum-bal, 6302 (K) – cum-bal, 6303 (K) – cum-bal; *Mahmout* (??) 1887 (SING) – cer; *Maingay* '324' (A, BM, CGE, K, L) – pat, '325' (BM, K) – pend, '363' (A, G, E, K) – pent-pauc, '1379' (K) – ery, '1382' (K) – pat, '2459' (K) – pat, 2525 (K, L) – ery; *Mann s.n.* (CALC) – cum-bal; *Meijer* 2075 (A, L, LAE, SING) – sar, 2297 (A, K, L, LAE, SING) – sar, 5793A (L) – cer; *Merrill* 1890 (K) – pat, 2933 (BM) – pent; *Millar & Gebo* 1154 (LAE, UPNG) – scho; *Müller* 921 (L. P) – cum-bal; *Murton* 95 (BM, K) – pent-pauc; *Mzadiman s.n.* (SING) – pat.

NBFD 1523 (K) – sar; *van Niel* 3847 (L) – ama, 4335 (L) – ama; *NGF* 148 (L, LAE) – lasioc-wein, 228 (LAE) – cer, 238 (K, L, LAE) – lasioc-wein, 528 (LAE) – lon, 596 (K, L, LAE) – lasioc-tric, 695 (LAE) – lasioc-wein, 699 (LAE) – cum, 801 (L, LAE) – lon, 868 (K, L, LAE) – cum, 869 (K, L, LAE) – cer, 905 (LAE) – lasioc-wein, 908 (LAE) – lasioc-wein, 911 (LAE) – lasioc-wein, 913 (LAE) – cer, 1185 (K, L, LAE) – lasioc-wein, 1650 (LAE) – cer, 1704 (K, L, LAE) – lasioc-wein, 1725 (K, L, LAE) – cer, 1740 (K, L, LAE) – cum, 2055 (K, L, LAE) – cer, 2056 (K, L, LAE) – cum, 3208 (K, LAE) – lasioc-wein, 3244 (K, LAE) – lasioc-wein, 3430 (BM, K, LAE, SING) – cum, 3586 (FHO, K, LAE, SING) – lasioc-wein, 3684 (K, LAE) – lasioc-schum, 3697 (FHO, K, LAE, SING) – lasioc-pach, 3812 (LAE) – cum, 3848 (FHO, K, LAE, SING) – lasioc-schum, 3921 (FHO, K, LAE, SING) – lasioc-schum, 3928 (FHO, K, LAE) – lasioc-car, 4010 (FHO, K, LAE, SING) – lon, 4015 (FHO, K, LAE, SING) – lasioc-wein, 4081 (K, LAE) – lasioc-wein, 4577 (K, L, LAE) – scho, 5264 (K, LAE, SING) – cum, 5288 (K, LAE, SING) – lasioc-wein/schum, 5618 (K, LAE) – say, 6215 (K, L, LAE) – lasioc-wein, 6219 (K, L, LAE) – lasioc-wein, 6427 (K, LAE) – lasioc-wein/schum, 6566 (K, LAE) – lasioc-wein/schum, 6671 (K, L, LAE, SING) – cer, 7035 (K, LAE)–cer, 7067 (K, L, LAE) – cer, 7075 (BM, K, LAE, SING) – lasioc-wein/schum, 7162 (K, L, LAE, SING) – cer, 7248 (K, LAE, SING) – lasioc-wein, 7327 (K, LAE) – lasioc-wein, 7334 (K, LAE) – cum, 7428 (K, LAE) – lon, 7517 (K, LAE) – cum, 7533 (K, LAE, SING) – lasioc-wein, 7943 *p.p.* (BM, K, LAE, SING) – lasioc-wein/schum, 7943 *p.p.* (LAE) – cer, 7989 '9789' (K, L, LAE) – sap, 8045 (K, L, LAE) – cer, 8162 (K, L, LAE, SING) – cer, 8170 (K, LAE) – lasioc-wein, 8207 (LAE) – lasioc-wein, 8256 (LAE) – scho, 8812 (K, LAE) – lasioc-wein, 9164 (K, L, LAE) – lon, 9667 (K, LAE, SING) – lasioc-wein, 10015 (LAE) – novob, 10106 (K, LAE, SING) – lasioc-wein, 10128 (K, LAE, SING) – lasioc-wein, 10132 (K, LAE, SING) – lon, 10206 (LAE) – lon, 10253 (LAE) – cer, 10451 (K, LAE) – pohl, 10536 (L, LAE) – cer, 10537 (L, LAE) – lasioc-wein, 10542 (K, L, LAE, SING) – cer, 10830 (K, LAE, SING) – lasioc-wein/schum, 10884 (LAE) – cum, 11608 (K, LAE, SING) – cum, 11665 (K, LAE, SING) – say, 11750 (LAE) – lasioc-wein, 11926 (LAE) – sap, 13038 (LAE) – cer, 13259 (K, L, LAE, SING) – cer, 13269 (L, LAE) – lasioc-form, 13277 (K, L, LAE) – cer, 14348 (L, LAE) – cer, 14358 (K, L, LAE) – lasioc-wein, 14358 (LAE) – lasioc-wein, 14417 (K, L, LAE) – cer, 14862 (K, LAE) – cum, 15439 (LAE) – lasioc-wein, 16086 (E, LAE, SING) – cer, 16936 (LAE, SING) – say, 17014 (K, LAE) – lasioc-wein, 17186 (K, LAE) – lasioc-wein, 17299 (E, K, L, LAE, SING) – lasioc-wein, 17609 (K, LAE, SING) – say, 17800 (E, K, L, LAE, SING) – lasioc-wein, 18400 (L, LAE) – lasioc-wein, 18413 (LAE) – lasioc-wein, 19154 (LAE) – sap, 19176 (K, L, LAE, SING) – lon, 19205 (K, L, LAE) – sap, 19271 (LAE) – say, 19416B (LAE) – lasioc-wein, 19515 (K, LAE, SING, tending to weinlandii) – lasioc-tric, 19624 (LAE) – cer, 19633 (K, LAE) – cer, 21573 (BM, FHO, L) – lasioc-wein, 21740 (K, SING) – lasioc-wein/schum, 21758 (K, LAE, SING) – lasioc-wein/schum, 22127 (LAE) – scho, 22409 (K, LAE, SING) – lasioc-tric, 22410 (LAE) – novob, 22445 (L (photo FHO), LAE) – novob, 23049 (LAE) – lasioc-wein, 23481 (K, L, LAE) – cer, 23576 (LAE) – say, 23601 (K, L, LAE, SING) – cum, 24024 (K, LAE) – lasioc-wein, 24029 (K, LAE, SING) – cum, 24041 (LAE) – novob, 24324 (L, LAE) – lasioc-wein, 24328 (L, LAE) – lasioc-wein, 24335 (L, LAE) – lasioc-wein, 24848 (K, L, LAE, SING) – cum, 26489 (K, L, LAE) – cer, 26582 (K, LAE, SING) – cer, 26683 (LAE) – novob, 26727 (BM, LAE, SING) – lasioc-wein/schum, 27530 (E, K, L, LAE) – lon, 28011 (LAE) – lasioc-pach, 28014 (K, LAE) – lasioc-tric, 28610 (L, LAE) – say, 28748 (L, LAE) – say, 28808 (LAE) – say, 29141 (K, L, LAE, SING) – cer, 29406 (K, L, LAE, SING) – cum, 30900 (K, L, LAE, SING) – cum, 30901 (L, LAE) – sap, 31344 (K, LAE) – schum, 32641 (E, K, L, SING) – cum, 32674 (L, LAE) – ten, 32725 (E, K, LAE) – lasioc-wein, 32790 (LAE) – lasioc-schum, 33348 (LAE) – A, 33428 (LAE) – A, 33466 (LAE) – A, 33911 (K) – lasioc-wein, 33911 (K, LAE) – lasioc-wein, 33917 (K, LAE, SING) – lasioc-wein/schum, 33920 (K, LAE) – lasioc-wein, 34049 (L, LAE) – lon, 34112 (L, LAE) – say, 34236 (LAE) – cer, 35387 (K, LAE, SING) – lasioc-wein/tric, 36302 (K, L, LAE) – cer, 37266 (L, LAE) – pohl, 37534 (K, LAE) – lasioc-schum, 37702 (LAE) – cum, 37713 (K, L) – cum, 38001 (K, LAE) – cum, 38514 (E, K, L, LAE, SING) – gli, 38920 (K, L, LAE) – pohl, 39031 (LAE) – lasioc-novog, 39260 (L, LAE) – ten, 40566 (K, LAE) – lasioc-wein/schum, 41464 (K, LAE) – lon, 41496 (LAE) – lasioc-tric, 41853 (LAE) – gli, 41896 (K, L, LAE) – cum, 42048 (L, LAE) – pohl, 42296 (K, LAE) – lasioc-wein, 42298 (K, LAE) – say, 42679 (LAE) – lasioc-pach, 42784 (K, LAE) – lasioc-wein, 43588 (K, LAE, SING) – say, 43964 (K, LAE) – cer, 44399 (K, L, LAE, SING) – lasioc-wein, 44400 (K, LAE) – lasioc-wein, 45140 (LAE) – sap, 45834 (L, LAE) – lasioc-tric/schlec, 46028 (E, K, L, LAE) – cum, 46065 (K, L, LAE) – cum, 46532 (K, LAE) – lasioc-schum, 46710 (K, LAE) – lasioc-schum, 46746 (K, LAE) – cer, 46749 (K, LAE) – cum, 46941 (LAE) – say, 47427B (K, LAE) – cer, 48865 (LAE) – sap, 49501 (LAE) – lasioc-wein.

Paijmans 157 (LAE) – cum; *Panoff* 434 (LAE) – lasioc-wein; *Parry* 1277 (K) – cum-bal; *Paymans* 12 (L) – ery,

110 (L) – sar; *Pelenkahn s.n.* (CALC, G, K, L) – pent; *Pennington* 7804 (FHO) – macro, 7827 (FHO) – pend, 7828 (FHO, KEP, SING) – sar, 7830 (FHO, KEP, SING) – pat, 7835 (FHO, KEP, SING) – sar, 7853 (FHO) – cer, 7858 (FHO, KEP) – macro, 7858A (FHO) – macro, 7861 (FHO, KEP, SING) – ery, 7865 (FHO, KEP, SING) – pent-pauc, 7873 (FHO, SAN) – pent-med, 7879 (FHO, SAN) – sar, 7882 (FHO, SAN) – sar, 7883 (FHO, SAN) – pent-med, 7896 (FHO, SAN) – sar, 7910 (FHO, SAN) – saras, 7911 (FHO, L, SAN) – med, 7912 (FHO) – med, 7913 (FHO) – med, 7915 (FHO, SAN) – ? macro, 7917 (SAN) – cer, 7924 (FHO, L, SAN) – sar, 7930 (FHO) – pent, 7934 (FHO, SAN) – ? macro, 7941 (FHO) – gra, 7945 (FHO) – cum-kin, 7946 (FHO, L, SAN) – cum-kin, 7987 (FHO, L, SAR) – pent-pauc, 7995 (FHO, SAR) – pat, 8002 (FHO) – med, 8013 (FHO, SAR) – sar, 8017 (FHO, KEP) – sar, 8027 (FHO, KEP, L, SING) – tom, 8029 (FHO) – sar, 8033 (FHO, L, LAE) – lon, 8051 (FHO, L, LAE) – cer, 8052 (FHO, LAE) – cum, 8053 (FHO, LAE) – say, 8058 (FHO, L, LAE) – cer, 8062 (FHO, LAE) – lasioc-wein, 8077 (FHO, L, LAE) – lon, 8084 (FHO, LAE) – cum, 8089 (FHO, L, LAE) – lon, 8090 (FHO, LAE) – lasioc-wein, 8104 (FHO, L, LAE) – cer, 8109 (FHO) – cum; *Petelot* 5833 (A) – cum-bal, 8663 (A) – cum-bal; *Phusomsaeng* 35 (K, L, P) – macro-fulv, 59 (L) – pend, 170 (L) – dys, [*& Pinning*] 324 (L) – pend, 348 (K) – pend, 420 (K) – cer; *Phyt. Survey* 417 (KEP) – pat, 1195 (KEP) – pat, 1904 (KEP) – pat, 1956 (K, KEP, SING) – pat, 2182 (KEP) – pat, 2280 (KEP) – pat, 2288 (KEP) – pat; *Pierre* 1619 (BM, E, G, K, L, LE, P) – ? cer; *Pleyte* 173 (A, K, L, SING) – lao, 230 (A, K, L, SING) – lao, 360 (K, L, SING) – lao, 1113 (K, L, SING) – lasioc-wein/form; *PNH* 94 (A) – pent-med, 143 (A, L) – pent-pauc, 2783 (SING) – pent, 4766 (A) – pat, 6403 (A) – pat, 8538 (A) – pat, 10495 (L, photo at FHO) – caul, 11425 (A, SING) – pent, 14344 (A) – pat, 14424 (A) – pent, 14459 (A, BM, K, L) – men, 17843 (A, K, SING) – pent, 18615 (A) – pat, 34502 (K, LAE) – pat, 37096 (BM, K) – cer, 37151 (K) – pat, 78075 (A, K) – cer, 78127 (A, K) – pat; *Poilane* 6374 (P) – cum-bal, 7327 (E, P) – cum-bal, 7843 (L, P) – cum-bal, 8429 (P, photo FHO) – pell, 10510 (P) – cum-bal, 10829 (P) – cum-bal, 19855 (P, SING) – cum-bal, 21779 (K, P) – cum-bal, 22268 (K, L) – cum-bal; *Porter in E.I.C.* 1255 (BM, CGE, K, K-W, LE) – pend, *s.n.* (A, BM, CGE, G, K-W, LE) – pat; *Pullen* 968 (L, LAE) – cer, 1379 (L, LAE) – lasioc-pach, 1401 (L, LAE) – lasioc-pach, 1531 (L, LAE) – pohl, 1789 (LAE) – lasioc-form/schum, 6341 (LAE) – cer, 7326 (K, LAE) – lasioc-wein, 7352 (K, LAE) – lasioc-wein, 7537 (LAE) – say, 7563 (LAE) – say, 8108 (L, LAE) – say, 8119 (LAE) – cer, 8185 (LAE) – lasioc-wein, 8195 (K, LAE) – lasioc-wein; *Put* 3629 (K, L) – pend.

'*R*' (Roxb. f. ?) (CALC) – pat; *Rahmat si Boeea* 302 (A) – lasiog (*si Toroes*), 5420 (A, G, K, L) – pat, 7844 (A) – lasiog, 9133 (A, L) – lasiog; *Ramos* 1217 (A) – poly, 1252 (A, K) – sar, 1660 (A) – pent-pauc, 1708 (G) – cer, 1732 (A, K) – pat, 18212 (LE) – cum, 46966 (L) – cum; *Rastini* 177 (K, L, SING) – lasioc-wein, *s.n.* (K, SING) – lasioc-wein; *Reinwardt* '47' (FHO, photo) – pent, '878' (L) – pat; *Richards* 1460 (K, SING) – cer, 2539 (K) – set, 2631 (K, SING) – med; *Ridley* 373 (SING) – pend, 1094 (BM, SING) – pat, 1296 (SING) – pauc, 1631 (SING) – pauc, '1910' (BM) – pend, 4762 (K) – pat, 4763 (BM, G, K) – pat, 4764 (BM, SING) – pat, 4765 (G, SING) – pat, 4767 (K, SING) – macro, 5819 (BM. K. SING) – pat, 5965 (K, SING) – ery, 7030 (BM, SING) – cer, 7909 (SING) – pent-pauc, 8387 (SING) – pent-pauc, 8448 (K, SING) – pent-pauc, 8609 (SING) – pat, 9108 (E, K, SING) – pat, 9187 (SING) – pat, 10843 (SING) – pat, 11080 (SING) – pent-pauc, 11962 (K) – per, 11963 (SING) – per, 12566 (BM, SING) – pent-panc, *s.n.* (BM, 8/14) – pat (BM, SING) – pent-pauc, *s.n.* (K, 3/15) – cer, *s.n.* (K) – pend, *s.n.* (BM) – pauc, *s.n.* (SING) – ery, *s.n.* (SING) – pat, *s.n.* (SING) – pend, *s.n.* (SING) – pent-pauc; *Robbins* 1878 (LAE) – lasioc-pach, 1995 (K) – pent; *Rock* 928 (US) – cum-bal, 1867 (A) – grand; *Römer* 6 (L) – lasioc-wein; *Roxburgh s.n.* (BM) – cum-bal; *van Royen* 3439 (K, LAE) – lasioc-lasioc [*& Sleumer*] 6815 (K) – lasioc-wein, 7602 (K) – lasioc-form; *RSS* 2665 (K, LAE, SING) – lasioc-schum, 6107 (K, LAE, SING) – lasioc-schum, 6286 (K, LAE) – lasioc-schum.

S 670 (SAR) – ama, 1461 (SAR) – ama, 2064 (SAR, SING) – ama, 4060 (A, K, SING) – macra, 4281 (A) – pent-pauc, 7769 (L) – rub, 8087 (BM, K, KEP, KLU, SAR, SING) – ama, 9003 (K, SAR, SING) – ama, 9260 (K, L, SAR, SING) – ama, 9269 (K, L, SING) – ama, 12128 (FHO, K, L, SAR) – macra, 12141 (A, FHO, K, L, SAN, SAR, SING) – lan, 12146 (K, SAR) – sar, 12258 (K, L, SAR, SING) – ama, 12947 (SAR) – ama, 13382 (SAN, SAR) – sar, 13402 (SAR) – pent-pauc, 13658 (K, SAR) – pent-pauc, 13666 (SAR) – pat, 13765 (FHO, K, L, SAR ?) – macra, 14577 (L, SAR, SING) – rub, 15287 (K, L, SAR) – rub, 16181 (A, K, L, SAN, SAR, SING) – rub, 17706 (A, K, L, SAR) – macra, 18476 (A, FHO, K, L, SAN, SAR, SING) – sar, 19049 (A, FHO, K,L, SAN, SAR, SING) – macra, 19233 (FHO, K, L, SAR) – med, 21307 (FHO, K, SING) – B, 21346 (A, FHO, K, L, SAN, SAR) – pent-pauc, 21353 (A, FHO, L, SAN, SAR) – pent-pauc, 21788 (A, FHO, K, L, SAN, SAR, SING) – med, 22806 (A, FHO, K, SAN, SAR) – pent-pauc, 22921 (FHO, K, SAR) – cru, 23036 (A, FHO, K, L, SAN, SAR) – pent-pauc, 23304 (A, FHO, K, L, SAN, SAR, SING) – med, 23329 (FHO, K, L, SAR) – cru, 24146 (FHO, K, SAR) – pent-pauc, 24440 (FHO, K, SAN, SAR) – pent-pauc, 24871 (SAR) – macra, 25565 (SAR) – ama, 25844 (K, SAR) – B, 26965 (FHO) – pat, 27423 (FHO, K, L, SAR) – rub, 27778 (FHO, L, SAR) – ery, 27889 (FHO, K, L, SAN, SAR, SING) – rub, 28269 (SAR) – cer, 28793 (FHO, K, L) – B, 29982 (K, L, SAR) – macra, 30697 (FHO, K, SAR) – sar, 31130 (FHO, SAR) – poly, 31533 (FHO, K, SAR, SING) – poly, 31541 (FHO, K, SAR) – pent-pauc, 31542 (FHO, K, SAR, SING) – sar, 31577 (FHO, SAR) – saras, 31804 (K, SAN, SAR) – macra, 32151 (FHO, K, SAR) – rub, 33183 (FHO, K) – pat, 33753 (FHO) – cer, 34440 (FHO, SAR) – sar, 34950 (FHO, SAR) – lan, 34984 (FHO, SAR) – lan; *Sablaya* 34 (A, K) – cum, 77 (A, K) – pat; *Samsuri et al.* SH 437 (SING) – pat, SA 451 (KEP, SING) – tom, SA492 (KEP, L) – pat, 538 (SING) – pat, SA 770 (SING) – pend, 912 (SING) – pat; *SAN* A 34 (K) – pent-pauc, 43 (K, SING) – saras, 128 (K) – pent, 636 (A, K, SING) – sar, 962 (K, L, SING) – sar, 1700 (K, SING) – sar, 1871 (K) – pent-med, 2170 (K, SING) – pat, 3401 (K, SING) – sar, 3444 (A, SING) – cer, 3450 (L, SING) – sar, 3694 (A, SING) – macra, 3868 (L, SAN) – sar, 4824 (A, K, SING) – cer, 7046 (SING) – sar, 10179 (K, SING) – sar, 10289 (K) – pent-pauc, 10374 (K) – pent-pauc, 10384 (K, L) – sar, 13402 (K) – pent-pauc, 16008 (K) – pent-med, 16204 (A) – pent-med, 16501 (A, K) – med, 17222 (K, L, SING) – sar, 17454 (A, KEP, K, L, SING) – ama, 18305 (SAN) – sar, 19009 (K, L, SAN) – sar, 19132 (SAR) – sar, 19249 (K, L, SAR, SING) – sar, 19923 (K, SAN)

– ery, 20611 (SAN) – sar, 20811 (?7) (SAN) – sar, 21130 (K, SING) – sar, 21180 (SING) – sar, 21201 (K, L) – pent-med, 21296 (K, L) – pent-med, 21352 (K, L) – pent-med, 21355 (SAN) – poly, 21476 (K, SAN, SAR, SING) – sar, 21484 (K, L, SAR) – pent-med, 22142 (K) – pent-med, 22542 (K, SAR) – pent-med, 22555 (A, K, SAN) – pent-med, 22798 (A, K, L, SAR) – sar, 23198 (SAN) – cer, 24160 (SAN, SAR) – pent-med, 24357 (SAR) – pent-pauc, 24448 (SAN) – sar, 24462 (K, L) – pent-med, 24671 (SAN) – pat, 24732 (SAN) – cer, 24761 (K, SING) – pat, 24790 (K, SAN, SAR, SING) – sar, 25322 (K, SAR) – pent, 25386 (K, SAR) – pent-pauc, 26003 (K) – cer, 26260 (K, L, SAR) – pent-pauc, 26327 (K) – pent, 26539 (K, L, SAN, SAR, SING) – sar, 26852 (K, SAN, SING) – sar, 26960 (K) – pent-med, 26978 (K, SAN) – lan, 27357 (K) – pent-med, 28629 (K, SAN, SING) – sar, 28928 (K, LE, SAN) – pent, 29410 (SAN) – pent, 29473 (K, SAN, SAR) – pent-med, 29528 (K, SAN) – saras, 29690 (K, L, SAN) – sar, 29724 (K, SAN) – pent, 29821 (K) – lan, 30006 (K, SAN) – pent-med, 30157 (K, L, SAN) – poly, 30162 (SAN) – set, 30376 (K) – pent-med, 30487 (K) – pent-med, 30574 (K, L, SAN) – sar, 30677 (K, SAN, SING) – cer, 30689 (K, SAN) – sar, 30737 (K, L, SAN) – lan, 31004 (K) – pent-med, 31009 (K, L, SAN) – sar, 31087 (K, SAN) – macro, 31185 (K, L, SAN) – sar, 31330 (K, SAR) – pent-med, 31343 (K, SAN) – pent, 31517 (SAN) – lan, 32026 (SAN) – cer, 32490 (SAR) – pent-pauc, 32550 (K) – pent-med, 32563 (K, L, SAN) – sar, 32576 (K, SAN, SAR) – macra, 32584 (SAN, SING) – sar, 32637 (K, SAN) – cer, 33041 (K, L, SAN) – sar, 33107 (SAR) – pent-pauc, 33172 (K, L, SAN, SING) – sar, 33381 (K) – pent-pauc, 33633 (K, L, SAN) – ery, 34259 (SAN) – macra, 34260 (K) – pent-med, 34270 (SAN) – sar, 34282 (SAN) – set, 34298 (SAN) – saras, 34300 (K, L, SAN) – sar, 34930 (K, SAN, SING) – sar, 34927 (SAN) – macra, 34971 (SAN) – lan, 35154 (LE, SAR) – pent-pauc, 35258 (SAN) – pent, 35319 (K) – pent-med, 35433 (SAN) – pent-pauc, 35772 (K, L, SAN, SING) – sar, 36018 (SAN, SAR) – C, 36347 (K) – pent-med, 36717 (LE, SAR) – pent-pauc, 36935 (K) – med, 37378 (SAN) – med, 37546 (LE SAR) – pent-pauc, 37559 (K, SAR) – pent-pauc, 38209 (K, SAN) – pent-med, 38379 (K, SAN) – ery, 38736 (K) – pent-med, 38775 (K) – pent-med, 38875 (K, L) – sar, 39141 (SAN) – cer, 39142 (SAN) – med, 39149 (SAN) – med, 39292 (LE) – pent-pauc, 39345 (K, SAR) – pent-med, 39453 (LE, SAR) – pent-pauc, 39463 (K) – pent-med, 39484 (K, SAN) – sar, 39711 (K, LE) – pent-med, 39719 (K, L, SAN) – sar, 39737 (K) – pent-med, 39743 (K, L, SAN, SING) – sar, 39913 (SAN) – pent-med, 40389 (K) – pent, 40533 (K, SAR) – pent-med, 40572 (LE, SAR) – pent-pauc, 40604 (SAN) – med, 40682 (K, SAN, SAR) – pent-pauc, 40758 (K) – pent, 41010 (K, L) – sar, 41320 (K, L, SAN, SAR) – ery, 41442 (K) – pent-med, 41570 (K, SAN) – sar, 41907 (K, SAN) – pat, 42075 (K, SAN) – poly, 42112 (K) – pent, 42241 (K, SAN) – C, 43362 (SAN) – sar, 43854 (SAN) – pent, 44563 (K, SAN) – ko, 45856 (SAN) – sar, 46170 (SAN) – sar, 46200 (K, L, SAN) – sar, 46325 (SAN) – sar, 47160 (SAN) – sar, 47163 (K) – pent-med, 47163 (SAR) – pent-pauc, 47192 (K, L, SAN) – sar, 47255 (K, SAN) – pent, 47632 (K) – pent-med, 47751 (K) – pent-med, 47781 (SAR) – pent-pauc, 48053 (K) – pent-pauc, 48968 (K, SAN) – pent, 48988 (K) – pent, 49166 (SAN) – ery, 49763 (K, SAN) – poly, 49801 (SAN) – pent-pauc, 50363 (K, L, SAN) – ery, 50478 (K) – pent-pauc, 51229 (SAN) – sar, 51303 (SAN) – cer, 51751 (SAN) – cer, 52600 (SAN) – cer, 52695 (SAN) – pat, 52794 (K, SAN) – pent, 53409 (K, L, SAN) – pat, 53457 (K, L, SAN, SAR, SING) – sar, 53941 (SAN) – sar, 54462 (SAN) – sar, 54524 (K, L, SAN) – sar, 54628 (K) – pent-med, 55163 (K) – pent-pauc, 56156 (SAN) – sar, 56955 (SAN) – sar, 57164 (SAN) – sar, 57196 (K, L, SAN) – sar, 57253 (K) – pent-pauc, 57318 (SAN) – pent-med, 57319 (K) – pent, 58038 (SAN) – pent-med, 58432 (FHO, K, L, SAN) – sar, 58513 (SAN) – sar, 61234 (K) – pent-pauc, 61727 (SAN) – sar, 62068 (FHO, K, L, SAN) – sar, 62147 (SAR) – pent-pauc, 62166 (SAN) – cer, 62425 (FHO, SAN) – poly, 62869 (K) – set, 62884 (FHO, SAN) – sar, 63552 (K, L, SAN) – sar, 63695 (SAN) – cer, 63819 (K, SAN) – pent, 64603 (SAN, SAR) – sar, 65894 (SAN) – sar, 66051 (SAN) – macra, 66873 (FHO, K, L, SAN) – sar, 67192 (K, SAN) – sar, 67234 (FHO, K, SAN) – ery, 68506 (FHO, SAN) – pat, 71008 (FHO, SAN) – pat, 71167 (SAN) – pat, 71544 (FHO, K, SAN) – sar, 71775 (SAN) – cer, 72697 (SAN) – cer, 72844 (SAN) – sar, 70365 (SAN) – sar, 73426 (SAN) – ery, 73541 (SAN) – sar, 73699 (FHO, K, SAR) – pent-med, 73709 (FHO, K) – pent-med, 74352 (K) – sar, 74360 (K, SAN) – sar, 74460 (SAN) – cum-kin, 74532 (FHO) – pat, 74958 (K, SING) – sar, 75490 (FHO, K) – poly, 75492 (FHO) – sar, 75986 (FHO, K) – pat, 76067 (FHO, K, SAN) – poly, 76651 (FHO) – pent-med, 76676 (FHO, SAN) – poly, 78021 (FHO, K) – ery, 78122 (FHO) – pat, 78469 (FHO) – sar, 78613 (FHO, K) – pent-med, 78637 (FHO) – pent-med, 78643 (FHO, K) – pent-med, 79690 (FHO) – pent-med, 79763 (FHO) – lan, 79773 (FHO, K) – lan, 80374 (FHO) – ery, 81026 (FHO) – pent-med, 81222 (FHO) – pat, 81223 (FHO) – sar, 81309 (FHO) – cer, 81312 (FHO) – cer, 81375 (FHO) – poly, 81436 (FHO) – cer, 81447 (FHO) – sar, 81773 (FHO) – sar, 81903 (FHO) – cer, 82077 (FHO) – sar, 82145 (FHO) – sar, 82344 (FHO) – sar, 82345 (FHO) – pent, 82406 (FHO) – poly, 82437 (FHO) – med, 82565 (FHO) – sar, 82804 (FHO) – pent-pauc, 82871 (FHO) – sar, 82954 (FHO) – pent-med, 83010 (FHO) – sar, 83054 (FHO) – poly, 83097 (FHO) – pent-pauc, 83162 (FHO) – med, 83177 (FHO) – med, 83552 (FHO) – pent-pauc, 83711 (FHO) – pent-med, 83978 (FHO) – pent-pauc, 84019 (FHO) – pent-pauc, 84993 (FHO) – pent, 85198 (FHO) – pat.

Sangkhachand 1390 (K, P) – cer; *Sargent s.n.* (A) – cum-bal; *Sar. Mus.* 414 (SAR) – ama; *Saunders* 59 (L, LAE) – cer, 186 (LAE) – cum, 238 (L, LAE) – cer, 390 (LAE) – cer, 401 (BM, K, LAE) – lasioc-wein, 459 (LAE) – lon, 545 (K, LAE) – cer, 923 (LAE) – cer, 941 (LAE) – cum, 1082 (LAE) – cum; *Sayer* 44 (G) – say; *Scheffer s.n.* (BP, MPU) – pat; *Schiefflin* 9 (LAE) – cer; *Schlechter* 17534 (L) – lasioc-pach, 18582 (B) – say; *Schmutz* 722A (L) – pent, 744 (L) – pent, 1275 (L) – pent; *Schodde* 2404 (LAE) – ? lon, 2510 (A, K, L, LAE) – scho, 2528 (K, LAE) – lasioc-wein, [*& Craven*] 3781 (K, LAE) – lasioc-schum, 3951 (K, LAE) – lasioc-tric, 4112 (K, L, LAE) – lasioc-tric, 4341 (LAE) – scho, 4448 (K, LAE) – lasioc-wein, 4457 (K, LAE) – lasioc-wein, 4605 (K, L, LAE) – scho, 5642 (LAE) – say; *Scortechini* '1' (BM, CALC, K) – cer, 48 (?) – pend, '82' (SING) – cer, '94' (E) – pauc, '199' (G, K, [ex SING]) – pauc, '219' (CALC, E, K, L) – sar, '314' (G) – cer, '324' (K, SING) – pat, 388 (CALC) – sar, '433' (G, LE) – cer, '716' (CALC, LE) – pent-pauc, '1343' (BM) – tom, *s.n.* (BM, G) – pent-pauc, *s.n.* (CALC, CGE, K [ex SING], LE) – pauc, *s.n.* (CALC) – per, *s.n.* (E, K) – tom; *SFN* 10205 (A, E, K, L, SAR, SING) – ery, 10542 (SING) – pauc, 10714 (SING) – pend, 11772 (K, SING) – pend, 11740 (SING) – pend, 11986 (SING) – pend, 18888 (SING) – pent-

pauc, 19038 (K, SING) – sar, 19080 (BM, K, SING) – sar, 20261 (K, SING) – macro, 21002 (SING) – pent-pauc, 21199 (KEP, SING) – ama, 21199A (SING) – ama, 21350 (K, L, LAE, SING) – sar, 21500 (K, SING) – cer, 23632 (SING) – pat, 23664 (KEP) – macro, 24755 (SING) – pauc, 25272 (E, K, SING) – macra, 26817 (SING) – lan, 27394 (SING) – lan, 28496 (BM, K, SING) – pent, 28568 (L, LAE, SING) – ama, 28595 (K, L, LAE, SING) – ama, 28674 (K, SING) – ama, 28675 (A, B, K, L, LAE, SING) – ama, 28714 (A, K, LAE, SING) – pauc, 29285 (K, SING) – tom, 29311 (B, K, L, LAE, SING) – sar, 29445 (K) – pent-pauc, 29445 (SING) – pent-pauc, 29465 (B, K, L, LAE, SING) – sar, 29718 (K, L, SING) – macro, 29959 (K, LAE, SING) – pauc, 30528 (KEP, SING) – pat, 32071 (KEP, SING) – pent-pauc, 32400 (KEP, SING) – pend, 32402 (A, K, KEP, SING) – ery, 32434 (K, L, SING) – ama, 32684 (L, LAE, SING) – macro, 33748 (K, SING) – sar, 33752 (BM, LAE) – pend, 34231 (A, E, K, SING) – cer, 34260 (B, K, LAE, SING) – cer, 35083 (K, SING) – cer, 35345 (BM, K, KEP, SING) – pent-pauc, 36292 (K, KEP, SING) – pat, 36418 (K, KEP, SING) – pat, 36986 (BM, K, KEP, LAE, SING) – pat, 37220 (A, K, KEP, LAE, SING) – pauc, 37268 (K, SING) – pat, 37393 (SING) – macro-mac/fulv, 37747 (K, KEP, SING) – pat, 39334 (SING) – pend, 39453 (BM, K, SING) – pat, 40112 (SING) – ama, 40589 (K, SING) – pat; *Shah* 167 (SING) – pent-pauc; *Shah & Shukor* MS 2450 (SING) – pent, 2635 (KEP, SING) – macro-fulv; *Sidek* S 334 (SING) – pend; *Simons s.n.* (BM) – cum-bal; *Sinclair* 5741 (E) – cum-bal, 6334 (E) – pat; *Singh & Samsuri* HS 1039 (LAE, SING) – pat; *Smith & Webb* 4920 (K) – lon; *Soa* (?) *s.n.* (Goat Hill) (BM) – tom; *Soekaria* 87 (L, SING) – pat; *Soepadmo* 231 (A, E, K, SING) – pat, 608 (KLU) – cer, 765 (KLU, L) – pauc, [*& Mahmud*] 9125 (A, KLU) – ery; *Stevens s.n.* (LAE) – lasioc-schum; *Stone* 5529 (KLU, L) – pauc, 7445 (KLU) – cer, 7488 (KLU, L) – pend, 12444 (KLU) – cer; *Strugnell* 10536 (E, K) – pat; *Sutrisno* 13 (K, L) – cum, 44 (K) – ko, 45 (K, LAE, SING) – ko, 58 (K, L, SING) – lasioc-wein/pach, 88 (K) – lasioc-wein; *Suvarnakoses* 1745 (L) – macro-fulv.

Tangkilisah 43 (K, L) – cer; *Teijsmann* 20 (L) – cum, 386 (K, L) – sar, 6058 (L) – lasioc-wein/lasioc, 6060 (K, L) – lasioc-wein/lasioc, 11734 (K, L) – pent, *s.n.* (CALC, L, U) – cer, *s.n.* (L) – pat, *s.n.* (L) – pat, *s.n.* (L) – pent-pauc, *s.n.* (U) – div; *Thorel s.n.* (K) – cum-bal; *Tsang* 26905 (A, E, K, P) – cum-bal, 27191 (A, E, K, P) – cum-bal, 30245 (A, E, K, L, P, SING) – cum-bal; *Ts'oong* 1889 (A, photo) – cum–bal.

Valeton 142A & B (G, K, L) – cum; *Versteeg* 1030 (L) – lasioc-wein, 1423 *p.p.* (K, L) – lasioc-vers, 1771 (K, U) – lasioc-wein, 1803 (U) – lasioc-wein, 1903 (K, L, U) – lasioc-wein; *Vidal* 164 (K) – pent, 702 (K) – pat, 704[f] (A) – pent, 704[g] (A) – pent, 704[h] (A) – pent, 704 *bis* (A) – pent, 1336 (K) – pat, 1340 (A, K) – pent, 2311 (A, K) – pent, 2317 (K) – pat, 2329a (K) – cum, 2330 (A) – cum, 2378 (K) – pat, *s.n.* (K) – pent, *s.n.* (K) – pent; *Vogel* 802 (K, L) – pent-pauc, 972 (K, L) – pent-pauc; *Voigt* 515 (A) – cum-bal; *Volck* 1476 (LAE) – lon, [*& Hyland*] 2122 (L) – lon; *de Vriese* 293 (L) – cum, *s.n.* (K) – pat.

Wall. Cat. 4891 (BM, K-W) – tom; *Wallich* 1829 (G) – pend, '1836' (Cat. 8069) (K, K-W, LE) – pat; *Wang* 77053 (A) – cum-bal, 80163 (A) – cum-bal; *Waterhouse* 136B (K, LAE) – lasioc-tric, 564B (K, LAE) – lasioc-schum, 631B (K) – lon, 822 (K) – lon, Y.80 (K) – lon; *Weber* 1570 (A, BM, K) – pent; *Weinland* 150 (L, SING) – lasioc-wein; *Wenzel* 65 (A, E) – pent, 206 (A, E) – pent, 311 (A, BM, G) – cer, 810 (A, BM, G) – cum, 988 (A, BM) – pat, 1289 (A, BM, G) – cum, 1600 (A, BM) – pent, 1740 (A, BM) – cum, 3280 (A, K) – caul, 3492 (A, K) – pat, 3520 (SING) – pent; *Whitford* 193 (K) – cum, 1039 (G) – pat, 1237 (G, K) – cum, 1314 (K) – cum, 1415 (BM) – pent, 1474 (SING) – pat, *s.n.* (K) – cum, *s.n.* (K) – pat; *Whitmore* 3032 (K, photo FHO) – rex; *Williams* 160 (SING) – pent, 232G (K) – cer, 522 (A, K) – pat, 567 (A, K) – pent, 589 (A, K) – cum, 2442 (A, K) – cum; *Winckel* 245 (K, L, U) – macro; *Wirat* 1136 (K) – cum-bal; *Wiriwan* 354 (K, LAE) – pent, 448 (A, K, L, LAE) – pent; *Wood* 657 (A, K) – poly, 950 (K) – pent-pauc; *Wray* 155 (G) – pend, 504 (K, photo FHO) – per, 504A (K) – per, 507 (K, SING) – cer, 1279 (BM, G) – pat, 1797 (SING) – cer, 1889 (SING) – cer, 2110 (SING) – tom, 2352 (SING) – tom, 2681 (CALC, K [ex SING]) – pauc, 3244 (CALC, G, SING) – pent, 3289 (CALC, SING) – cer, *s.n.* (CALC) – cer, *s.n.* (SING) – per.

Yates 2396 (B) – pent-pauc.

Zippelius s.n. (L) – lasioc, *s.n.* (BP, L) – pat.

Species *excludendae*

(i) **Chisocheton canalensis** Baillon, *Adansonia* **11** : 260 (1874, 'canalense') = *Dysoxylum canalense* (Baillon) C. DC.

(ii) **Chisocehton costatus** Hiern in Hook. f., *Fl. Br. India* **1** : 552 (1875); C. DC. in DC., *Monog. Phan.* **1** : 538 (1878); Brandis, *Ind. Trees* : 139 (1906). Type: India, Cachar, Shapore, 18 May 1873, *Ramdane in Keenan s.n.* (K!, holo) = *Dysoxylum* sp. Hiern hesitatingly placed this in *Chisocheton*, having only the one fruiting specimen. It closely resembles material at Kew labelled *D. lukii* Merr., e.g. Burma, Mergui, *Parker* 2562.

(iii) **Chisocheton dempoensis** Baker f. in *J. Bot., Lond.* **62,** supp. : 18 (1924) = *Dysoxylum dempoense* (Baker f.) Harms. Type: Indonesia, Sumatra, Mt. Dempo, 4000′, *Forbes* 2229 (BM!, holo; L!). This is *Walsura chrysogyne* (Miq.) Bakh. f.

(iv) **Chisocheton erythrocarpus** Hayata & Kanehira in Hayata, *Ic. Fl. Formosa* **10** : 2 ('*erythrocarpa*', 1921), *non* Hiern (1875) = *D. kusukusense* (Hayata) Kanehira & Hatusima.

(v) **Chisocheton hongkongensis** Tutcher in *J. Linn. Soc.* **37** : 64 (1905); Crook, *Fl. Pl. Hong Kong, Ran.-Mel.* : 99 (1930) = *Dysoxylum hongkongense* (Tutcher) Merr.

(vi) **Chisocheton kanehirae** Sasaki in *Trans. Nat. Hist. Soc. Formosa* **18** : 173, C (1928) = *Dysoxylum kusukusense* (Hayata) Kanehira & Hatusima.

(vii) **Chisocheton kusukusensis** Hayata, *Ic. Pl. Formosa* **3** : 52 (1913, 'kusukusense'); Kanehira, *Form. Trees* : 116 (1917) = *Dysoxylum kusukusense* (Hayata) Kanehira & Hatusima.

(viii) **Chisocheton rigidus** Ridley in *Bull. Misc. Inf. Kew* **1929** : 122 (1929) Types: Malaysia, Pahang, Temerloh, Kemasul Res., 19 Oct. 1925, *Hamid* FD 10880 (K!, syn) & Selangor, Kuala Lumpur, Weld Hill, *Rahman* 2829 & Johore, Castlewood, 1906, *Ridley* 12492 (K!, syn). The flowers and leaves of the Pahang and Johore specimens are those of *Dysoxylum* sp. (= *Forbes* 3088 (BM!) from Sumatra).

(ix) **Chisocheton sogerensis** Baker f. in *J. Bot., Lond.* **61,** suppl. : 8 (1923) = *Dysoxylum variabile* Harms (see Stevens, 1975 : 53).

(x) **Chisocheton sumatranus** Baker f. in *op. cit.* **62,** suppl. : 18 (1924). Type: Indonesia, Sumatra 1880, *Forbes* 2278 (BM!, holo; A!, L!, LE!). The flowers and leaves of the type are those of an *Aglaia.*

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Extant names are given in roman and synonyms in italic; new names are in bold, as are principal references